APPENDICES

APPENDIX A

SAMPLE CATALOGUE

Samples housed within the Geology Department rock store, University of Tasmania.

Catalog #	Sample No.	Rock name	Rock description	Coordinates	Group	Preparation
131790	21-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379130E, 5353160N	Anthony Road Andesite	PD,TS,R
131791	32-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379290E, 5352820N	Anthony Road Andesite	PD,TS,R
131792	35-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379390E, 5352850N	Anthony Road Andesite	PD,TS,R
131793	40-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380610E, 5355840N	Anthony Road Andesite	PD,LTS,R
131794	41-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380600E, 5355810N	Anthony Road Andesite	PD,TS,R
131795	42-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380615E, 5355790N	Anthony Road Andesite	PD,TS,R
131796	44-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380585E, 5355790N	Anthony Road Andesite	PD,TS,R
131797	45-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380330E, 5355350N	Anthony Road Andesite	PD,TS,R
131798	46-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380315E, 5355340N	Anthony Road Andesite	PD,R
131799	47-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380300E, 5355320N	Anthony Road Andesite	PD,TS,R
131800	48-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380270E, 5355300N	Anthony Road Andesite	PD,TS,R
131801	52-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380155E, 5355250N	Anthony Road Andesite	PD,TS,R
131802	53-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380115E, 5355255N	Anthony Road Andesite	PD,TS,R
131803	54-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380050E, 5355210N	Anthony Road Andesite	PD,TS,R
131804	55-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379905E, 5355255N	Anthony Road Andesite	PD,TS,R
131805	56-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380050E, 5355235N	Anthony Road Andesite	PD,TS,R
131806	59-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379755E, 5355120N	Anthony Road Andesite	PD,TS,R
131807	60-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379735E, 5355075N	Anthony Road Andesite	PD,TS,R
131808	61-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379675E, 5355035N	Anthony Road Andesite	PD,TS,R
131809	62-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379590E, 5354870N	Anthony Road Andesite	PD,TS,R
131810	63-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379570E, 5354855N	Anthony Road Andesite	PD,TS,R
131811	64-3/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379570E, 5354840N	Anthony Road Andesite	PD,TS,R
131812	82-3/94	Ironstone	Hematite-quartz	380625E, 5358440N	Lake Newton Ironstone	TS
131813	88-3/94	Ironstone	Hematite-quartz	380659E, 5358372N	Lake Newton Ironstone	TS
131814	89a-3/94	Ironstone	Hematite-quartz	380665E, 5358520N	Lake Newton Ironstone	PD,LTS
131815	89b-3/94	Ironstone	Hematite-quartz	380665E, 5358520N	Lake Newton Ironstone	LTS,R
131816	20-4/94	rhyolite	quartz-feldspar-phyric	381230E, 5358860N	Tyndall Group	PD,TS,R
131817	70-4/94	rhyolite	quartz-feldspar-phyric	380390E, 5358425N	Anthony Road Andesite	PD,LTS,R
131818	71-4/94	rhyolite	quartz-feldspar-phyric	380395E, 5358420N	Anthony Road Andesite	PD,LTS,R
131819	73-4/94	rhyolite	quartz-feldspar-phyric	380400E, 5358420N	Anthony Road Andesite	PD,TS,R
131820	74-4/94	rhyolite	quartz-feldspar-phyric	380600E, 5358400N	Anthony Road Andesite	PD,TS,R
131821	76-4/94	rhyolite	quartz-feldspar-phyric	380610E, 5358400N	Anthony Road Andesite	PD,TS,R
131822	80-4/94	rhyolite	quartz-feldspar-phyric	380315E, 5358370N	Anthony Road Andesite	PD,TS,R
131823	82-4/94	Ironstone	hematite-quartz	380610E, 5358425N	Lake Newton Ironstone	PD,TS,R
131824	18-5/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379830E, 5358540N	Anthony Road Andesite	PD,TS,R
131825	20-5/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379945E, 5358515N	Anthony Road Andesite	PD,R
131826	38-5/94	Dacite	feldspar-phyric; sericite altered	380015E, 5358342N	Central Volcanic Complex	PD,TS,R

Catalog #	Sample No.	Rock name	Rock description	Coordinates	Group	Preparation
131827	40-5/94	Fd dacite lithic	feldspar-phyric; sericite altered	379990E, 5358345N	Newton Dam Spillway Pack	PD,TS,R
131828	41-5/94	rhyolite	quartz-feldspar-phyric	380650E, 5359300N	Tyndall Group	PD,TS,LTS,R
131829	1-11/94	Feldspar sandstone	feldspar crystal bearing	378850E, 5354153N	Yolande River Sequence	PD,TS,R
131830	2-11/94	Feldspar sandstone	feldspar crystal bearing	378860E, 5354160N	Yolande River Sequence	PD,TS,R
131831	5-11/94	Fd-qtz sandstone	feldspar-quartz crystals	380660E, 5356120N	Tyndall Group	PD,TS,R
131832	6-11/94	Fd-qtz sandstone	feldspar-quartz crystals	380800E, 5356660N	Tyndall Group	PD,TS,R
131833	7-11/94	Welded Ignimbrite	Quartz-feldspar crystals; welded; shard-rich	381048E, 5357290N	Tyndall Group	PD,TS,R
131834	8-11/94	Fd-qtz sandstone	feldspar-quartz crystals	381065E, 5357340N	Tyndall Group	PD,TS,R
131835	9-11/94	Fd-qtz sandstone	feldspar-quartz crystals	381075E, 5357630N	Tyndall Group	PD,TS,R
131836	11-11/94	rhyolite	quartz-feldspar-phyric	381240E, 5358855N	Tyndall Group	PD,TS,R
131837	12-11/94	rhyolite	quartz-feldspar-phyric	380580E, 5359540N	Tyndall Group	PD,TS,R
131838	14-11/94	rhyolite	quartz-feldspar-phyric	380165E, 5360160N	Tyndall Group	PD,TS,R
131839	16-11/94	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379875E, 5358280N	Anthony Road Andesite	PD,TS,R
131840	25-11/94	rhyolite/dacite	feldspar-quartz-phyric; columnar jointed	378050E, 5352380N	intrudes Yolande River Seq	PD,TS,R
131841	11-1/95	Feldspar sandstone	feldspar crystal bearing	379305E, 5354695N	Yolande River Sequence	PD,TS,R
131842	24-1/95	f.g.siltstone	f.g.siltstone (Py alt.)	381045E, 5357290N	Tyndall Group	PD,TS,R
131843	25-1/95	rhyolite	quartz-feldspar-phyric	381195E, 5358985N	Tyndall Group	PD,TS,R
131844	27-1/95	rhyolite	quartz-feldspar-phyric	381250E, 5359100N	Tyndall Group	PD,TS,R
131845	32-1/95	mafic sandstone	hornblende-feldspar±pyroxene crystals	379840E, 5352370N	Anthony Road Andesite	PD,TS,R
131846	Crown Hill Andesite	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379460E, 5346300N	Crown Hill Andesite	PD,TS,R
131847	Owen Coherent	rhyolite	quartz-feldspar-phyric	381796E, 5359690N	intrudes Owen Conglomera	PD,TS,R
131848	BL1 91.35m	andesite/dacite	Feldspar-hornblende±pyroxene±quartz-phyric	380970E, 5352625N	Anthony Road Andesite	PD,R
131849	BL1 225.50m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380970E, 5352625N	Anthony Road Andesite	PD,R
131850	BL1 357.30m	rhyolite	quartz-feldspar-phyric	380970E, 5352625N	Anthony Road Andesite	PD,R
131851	BL2 145.0m	andesite/dacite	Feldspar-hornblende±pyroxene±quartz-phyric	380875E, 5353405N	Anthony Road Andesite	PD,R
131852	BL3 90.40m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380985E, 5353990N	Anthony Road Andesite	PD,R
131853	BL3 329.70	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380985E, 5353990N	Anthony Road Andesite	PD,TS,R
131854	BL4 188.70	basaltic andesite	Pyroxene-feldspar-phyric; vesiculated	380750E, 5353825N	Anthony Road Andesite	PD,TS,R
131855	BL4 198.8	basaltic andesite	Pyroxene-feldspar-phyric; vesiculated	380750E, 5353825N	Anthony Road Andesite	PD,R
131856	BL4 199.55	basaltic andesite	Pyroxene-feldspar-phyric; vesiculated	380750E, 5353825N	Anthony Road Andesite	PD,R
131857	BL4 265.60	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380750E, 5353825N	Anthony Road Andesite	PD,TS,R
131858	BL5 25.90m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380541E, 5353651N	Anthony Road Andesite	PD,R
131859	BL5 86.75m	basaltic andesite	Pyroxene-feldspar-phyric; vesiculated	380541E, 5353651N	Anthony Road Andesite	PD,R
131860	BL5 184.25m	basaltic andesite	Pyroxene-feldspar-phyric; vesiculated	380541E, 5353651N	Anthony Road Andesite	PD,R
131861	BL5 207.80m	basaltic andesite	Pyroxene-feldspar-phyric; vesiculated	380541E, 5353651N	Anthony Road Andesite	PD,R
131862	BL5 342.0m	rhyolite	quartz-feldspar-phyric	380541E, 5353651N	Anthony Road Andesite	PD,R
131863	BLD89-1 234.70m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380416E, 5352715N	Anthony Road Andesite	PD,R
131864	BLD89-2 117.10	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380985E, 5352615N	Anthony Road Andesite	PD,TS,R

Catalog #	Sample No.	Rock name	Rock description	Coordinates	Group	Preparation
131865	BLD89-2 244.40	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380985E, 5352615N	Anthony Road Andesite	PD,TS,R
131866	BLD89-3 98.30m	rhyolite	quartz-feldspar-phyric	381140E, 5352760N	Anthony Road Andesite	PD,R
131867	BLD89-3 260.50m	basalt dyke	Feldspar-pyroxene-phyric; dyke	381140E, 5352760N	intrudes Tyndall Group	PD,R
131868	BLD89-3 294.60m	basalt dyke	Feldspar-pyroxene-phyric; dyke	381140E, 5352760N	intrudes Tyndall Group	PD,R
131869	BLD89-3 324.10	basalt dyke	Feldspar-pyroxene-phyric; dyke	381140E, 5352760N	intrudes Tyndall Group	PD,TS
131870	HA4 381m	limestone	Carbonate	380907.089E, 5357523.960N	Tyndall Group	TS
131871	HA3 229.0m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380986.991E, 5358154.820N	Anthony Road Andesite	PD,R
131872	HA7 174.15m	rhyolite	quartz-feldspar-phyric	380617E, 5358501N	Anthony Road Andesite	PD,R
131873	HA8 18.30	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380620E, 5358630N	Anthony Road Andesite	PD,TS,R
131874	TYN1 221.80m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380958E, 5355660N	Anthony Road Andesite	PD,R
131875	TYN3 233.17m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380570E, 5356630N	Anthony Road Andesite	PD,R
131876	TYN3 350.21	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380570E, 5356630N	Anthony Road Andesite	PD,TS,R
131877	TYN4 73.15m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	381113.600E, 5356190.300N	Anthony Road Andesite	PD,R
131878	TYN4 226.0m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	381113.600E, 5356190.300N	Anthony Road Andesite	PD,R
131879	TYN5 5.0m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	381083.100E, 5356587.700N	Anthony Road Andesite	PD,R
131880	TYN5 306.0m	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	381083.100E, 5356587.700N	Anthony Road Andesite	PD,R
131881	LEECH HILL 297.80r	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379365.500E, 5353632.700N	Anthony Road Andesite	PD,R
131882	LEECH HILL 168.75r	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	379365.500E, 5353632.700N	Anthony Road Andesite	PD,R
131883	NC1 104.90m	basaltic dyke??	Feldspar-pyroxene-phyric; dyke	381212.500E, 5357318.300N	intrudes Tyndall group	PD,R
131884	NC1 763.55m	basaltic dyke	Feldspar-pyroxene-phyric; dyke	381212.500E, 5357318.300N	intrudes Tyndall group	PD,R
131885	NC2 379.85m	basaltic dyke	Feldspar-pyroxene-phyric; dyke	381329.300E, 5358110.500N	intrudes Tyndall group	PD,R
131886	NC2 385.85m	basaltic dyke	Feldspar-pyroxene-phyric; dyke	381329.300E, 5358110.500N	intrudes Tyndall group	PD,R
131887	AJ88	basaltic dyke	Feldspar-pyroxene-phyric; dyke	381511E, 5359494N	intrudes Owen Conglomera	PD,TS
131888	TYN3-1	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite
131889	TYN3-2	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite,R
131890	TYN3-3	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite
131891	TYN3-4	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite,R
131892	TYN3-5	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite,R
131893	TYN3-6	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite,TS,R
131894	TYN3-7	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite,R
131895	TYN3-8	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite,R
131896	TYN3-9	limestone	Carbonate	380570mE, 5356630mN	Tyndall Group	SO/Clcalcite,R
131897	HA1-10	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite
131898	HA2-11	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite,R
131899	HA2-12	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite
131900	HA2-13	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite
131901	HA2-14	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite

Catalog #	Sample No.	Rock name	Rock description	Coordinates	Group	Preparation
131902	HA2-15	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite
131903	HA2-16	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite
131904	HA2-17	limestone	Carbonate	380791.657mE, 5357429.890mN	Tyndall Group	SO/Clcalcite
131905	HA3-18	limestone	Carbonate	380986.991mE, 5358154.820mN	Tyndall Group	SO/Clcalcite,R
131906	HA3-19	limestone	Carbonate	380986.991mE, 5358154.820mN	Tyndall Group	SO/Clcalcite,TS,R
131907	HA3-20	limestone	Carbonate	380986.991mE, 5358154.820mN	Tyndall Group	SO/Clcalcite
131908	HA3-21	limestone	Carbonate	380986.991mE, 5358154.820mN	Tyndall Group	SO/Clcalcite,TS,R
131909	HA3-22	limestone	Carbonate	380986.991mE, 5358154.820mN	Tyndall Group	SO/Clcalcite,TS,R
131910	HA3-23	limestone	Carbonate	380986.991mE, 5358154.820mN	Tyndall Group	SO/Clcalcite
131911	HA3-24	limestone	Carbonate	380986.991mE, 5358154.820mN	Tyndall Group	SO/Clcalcite,R
131912	HA4-25	limestone	Carbonate	380907.089mE, 5357523.960mN	Tyndall Group	SO/Clcalcite,TS,R
131913	HA4-26	limestone	Carbonate	380907.089mE, 5357523.960mN	Tyndall Group	SO/Clcalcite,R
131914	HA4-27	limestone	Carbonate	380907.089mE, 5357523.960mN	Tyndall Group	SO/Clcalcite,TS,R
131915	HA4-28	limestone	Carbonate	380907.089mE, 5357523.960mN	Tyndall Group	SO/Clcalcite,TS,R
131916	HA4-29	limestone	Carbonate	380907.089mE, 5357523.960mN	Tyndall Group	SO/Clcalcite,R
131917	HA4-30	limestone	Carbonate	380907.089mE, 5357523.960mN	Tyndall Group	SO/Clcalcite
131918	HA6-31	limestone	Carbonate	381038.031mE, 5357690.200mN	Tyndall Group	SO/Clcalcite,R
131919	HA6-32	limestone	Carbonate	381038.031mE, 5357690.200mN	Tyndall Group	SO/Clcalcite,R
131920	HA6-33	limestone	Carbonate	381038.031mE, 5357690.200mN	Tyndall Group	SO/Clcalcite
131921	HA6-34	limestone	Carbonate	381038.031mE, 5357690.200mN	Tyndall Group	SO/Clcalcite,R
131922	BL3-35	limestone	Carbonate	380985mE, 5353990mN	Tyndall Group	SO/Clcalcite,R
131923	BL3-36	limestone	Carbonate	380985mE, 5353990mN	Tyndall Group	SO/Clcalcite
131924	BL3-37	limestone	Carbonate	380985mE, 5353990mN	Tyndall Group	SO/Clcalcite,R
131925	BL3-38	limestone	Carbonate	380985mE, 5353990mN	Tyndall Group	SO/Clcalcite
131926	9.-3/94	limestone	Carbonate	379659mE, 5354930mN	Anthony Road Andesite	SO/Clcalcite,R
131927	30a-11/94	limestone	Carbonate	380600mE, 5355540mN	Anthony Road Andesite	SO/Clcalcite,R
131928	30b-11/94	limestone	Carbonate	380600mE, 5355540mN	Anthony Road Andesite	SO/Clcalcite,R
131929	30c-11/94	limestone	Carbonate	380600mE, 5355540mN	Anthony Road Andesite	SO/Clcalcite,R
131930	9-2/95	rhyolite	quartz-feldspar-phyric	380590E, 5358420N	Anthony Road Andesite	PD
131931	10-2/95	Ironstone	hematite-quartz	380600E, 5358440N	Lake Newton Ironstone	PD
131932	11-2/95	Ironstone	hematite-quartz	380600E, 5358420N	Lake Newton Ironstone	PD
131933	12-2/95	Ironstone	hematite-quartz	380610E, 5358400N	Lake Newton Ironstone	PD
131934	13-2/95	Ironstone	hematite-quartz	380630E, 5358380N	Lake Newton Ironstone	PD
131935	14-2/95	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380600E, 5358370N	Anthony Road Andesite	PD
131936	15-2/95	Ironstone	hematite-quartz	380625E, 5358360N	Lake Newton Ironstone	PD
131937	16-2/95	Ironstone	hematite-quartz	380635E, 5358350N	Lake Newton Ironstone	PD

Catalog #	Sample No.	Rock name	Rock description	Coordinates	Group	Preparation
131938	17-2/95	andesite	Feldspar-hornblende±pyroxene±quartz-phyric	380660E, 5358400N	Anthony Road Andesite	PD
131939	18-2/95	Ironstone	hematite-quartz	380650E, 5358445N	Lake Newton Ironstone	PD
131940	NCS1	Black mudstone	Black mudstone; cleaved; laminated	381225E, 5359452N	Owen Conglomerate	TS
*Preparations						
TS=thin section						
LTS=large thin section						
R=hand specimen						
PD=powdered specimen						
SO/CI=oxygen&carbon isotope powder						

APPENDIX B

STRUCTURAL DATA

1. Data from domain 1
   - Bedding
   - Cleavage
     - S_2
   - Columnar jointing
   - Flow banding

2. Data from Domain 2
   - Bedding
   - Cleavage
     - S_1
     - S_2
     - S_3

3. Faults
   - Fault planes
   - Striation data from the Great Lyell Fault

1. Data from domain 1

(south and west of the Great Lyell Fault)

Readings are from the Yolande River Sequence, Anthony Road Andesite, CVC and the Tyndall Group.

Bedding

Field No.	Strike	Dip	Direction	Lithologic Association
197	300	52	E	Tyndall Group
197	325	53	E	Tyndall Group
203	345	64	E	Tyndall Group
204	355	62	E	Tyndall Group
204	345	63	E	Tyndall Group
205	002	74	E	Tyndall Group
206	352	74	E	Tyndall Group
207	352	50	E	Tyndall Group
208	332	71	E	Tyndall Group
209	005	83	E	Tyndall Group
210	353	62	E	Tyndall Group
211	002	64	E	Tyndall Group
211	005	71	E	Tyndall Group
211	359	75	E	Tyndall Group
214	355	78	E	Tyndall Group
217	356	74	E	Tyndall Group
217	352	71	E	Tyndall Group
217	345	65	E	Tyndall Group
218	350	66	E	Tyndall Group
219	002	63	E	Tyndall Group
227	154	79	E	Tyndall Group
228	165	78	W	Tyndall Group
241	359	52	W	Tyndall Group
241	001	55	E	Tyndall Group
245	357	78	E	Tyndall Group
246	005	72	E	Tyndall Group
247	340	79	E	Tyndall Group
249	330	65	E	Tyndall Group
250	000	70	E	Tyndall Group
289	005	80	E	Tyndall Group
290	325	60	E	Yolande River Sequence
292	345	62	E	Yolande River Sequence
292	325	81	E	Yolande River Sequence
1	345	68	E	Tyndall Group
2	352	62	E	Tyndall Group
3	341	59	E	Tyndall Group
4	005	80	E	Tyndall Group
5	355	75	E	Tyndall Group
6	346	76	E	Tyndall Group
9	330	64	E	Tyndall Group
10	348	80	E	Tyndall Group

11	349	78	E	Tyndall Group
12	352	84	E	Tyndall Group
13	003	75	E	Tyndall Group
14	350	70	E	Tyndall Group
15	008	76	E	Tyndall Group
15	009	84	E	Tyndall Group
16	350	66	E	Tyndall Group
16	341	64	E	Tyndall Group
18	354	78	E	Tyndall Group
29	330	88	E	Tyndall Group
29	345	82	E	Tyndall Group
31	350	84	E	Tyndall Group
32	345	78	E	Tyndall Group
33	345	71	E	Tyndall Group
33	342	73	E	Tyndall Group
39	335	80	E	Tyndall Group
41	335	68	E	Tyndall Group
41	003	63	E	Tyndall Group
41	018	69	E	Tyndall Group
43	130	73	E	Tyndall Group
43	135	76	E	Tyndall Group
43	142	71	W	Tyndall Group
48	353	53	W	Tyndall Group
49	164	50	W	Tyndall Group
49	162	51	E	Tyndall Group
54	142	71	W	Tyndall Group
55	325	71	W	Tyndall Group
114	005	83	W	Tyndall Group
114	335	85	E	Tyndall Group
115	356	85	E	Tyndall Group
120	330	61	E	Tyndall Group
127	195	66	E	Tyndall Group
128	358	72	E	Tyndall Group
128	006	79	W	Tyndall Group
174	015	81	E	Tyndall Group
183	176	78	E	Tyndall Group
184	165	67	E	Tyndall Group
184	169	65	W	Tyndall Group
195	335	59	W	Tyndall Group
195	345	61	W	Tyndall Group
-	355	55	E	Yolande River Sequence
79460E, 58000N	210	35	E	CVC?
79540E, 58200N	170	42	E	CVC?
379125E, 54200N	348	77	W	Tyndall Group
380575E, 54000N	348	54	W	
-	350	82	W	Tyndall Group
-	340	65	E	Tyndall Group
380725E, 59600N	343	58	E	Tyndall Group
-	330	62	E	
South Tyndall Ck	350	22	E	Tyndall Group
-	340	80	E	
South Tyndall Ck	342	25	E	Tyndall Group
South Tyndall Ck	354	26	E	Tyndall Group
South Tyndall Ck	352	77	E	Tyndall Group
South Tyndall Ck	320	44	E	Tyndall Group
South Tyndall Ck	012	60	E	Tyndall Group

South Tyndall Ck	316	52	E	Tyndall Group
South Tyndall Ck	316	53	E	Tyndall Group
South Tyndall Ck	302	46	E	Tyndall Group
South Tyndall Ck	150	65	E	Tyndall Group

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Field No.	Strike	Dip	Direction	Lithologic Association
near Newton Dam	348	68	E	Anthony Road Andesite
near Newton Dam	320	79	E	Anthony Road Andesite
Jasper Point	350	75	E	Anthony Road Andesite
8	150	85	W	Tyndall Group
8	325	81	E	Tyndall Group
7	160	84	W	Tyndall Group
15	168	72	W	Tyndall Group
15	137	71	W	Tyndall Group
19	310	74	E	Tyndall Group
20	180	75	W	Tyndall Group
22	335	67	E	Tyndall Group
23	310	73	E	Tyndall Group
29	340	88	E	Tyndall Group
37	320	61	E	Tyndall Group
54	170	62	W	Tyndall Group
177	165	67	W	Tyndall Group
379700E, 58000N	345	68	E	CVC?
380875E, 55600N	330	66	E	Tyndall Group
379650E, 54200N	175	84	W	Anthony Road Andesite?
379600E, 54200N	130	81	W	Anthony Road Andesite?
379100E, 54200N	332	76	E	Tyndall Group
379075E, 54200N	150	81	W	Tyndall Group
379325E, 54200N	314	81	E	Anthony Road Andesite
380750E, 54000N	152	68	W	Anthony Road Andesite
380435E, 52200N	165	78	W	Anthony Road Andesite
380615E, 54600N	167	78	W	
380640E, 54600N	170	70	W	
380675E, 54600N	167	59	W	
380575E, 54000N	168	83	W	
380575E, 54000N	140	68	W	
200	338	42	E	Tyndall Group
201	335	43	E	Tyndall Group
202	332	56	E	Tyndall Group
202	315	58	E	Tyndall Group
203	335	75	E	Tyndall Group
204	145	85	W	Tyndall Group
224	168	73	W	Tyndall Group
239	005	50	E	Tyndall Group
253	145	82	W	Anthony Road Andesite
253	342	81	E	Anthony Road Andesite
253	345	80	E	Anthony Road Andesite
253	005	75	E	CVC
254	135	73	W	CVC
254	142	86	W	CVC
256	275	60	E	CVC
256	230	75	W	CVC
267	146	81	W	CVC
270	135	76	W	CVC
271	346	76	E	CVC

272	140	81	W	CVC
275	160	83	W	Anthony Road Andesite
275	132	83	W	Anthony Road Andesite
281	347	83	E	Anthony Road Andesite
283	343	81	E	Anthony Road Andesite
287	160	86	W	Anthony Road Andesite
292	115	85	W	Yolande River Sequence
292	335	75	E	Yolande River Sequence
292	338	81	E	Yolande River Sequence
South Basin Lake	175	82	W	Anthony Road Andesite?
South Basin Lake	150	88	W	Tyndall Group?
South Basin Lake	165	74	W	Tyndall Group?
-	150	60	W	
-	147	82	W	
South Tyndall Ck	352	67	E	Tyndall Group
South Tyndall Ck	358	75	E	Tyndall Group
South Tyndall Ck	330	60	E	Tyndall Group
South Tyndall Ck	330	60	E	Tyndall Group
South Tyndall Ck	147	83	W	Tyndall Group
Jasper Point	327	55	E	Anthony Road Andesite
Jasper Point	132	77	W	Anthony Road Andesite

Columnar jointing

Orientation of columns from columnar jointed feldspar-hornblende-phyric andesite in creek south of Newton Dam Spillway.

	Trend	Plunge
	305^o	36^o
	292^o	36^o
	280^o	33^o
	315^o	36^o
Mean	297.8^o	36^o

Flow banding

Planes to flow banding in quartz-feldspar-phyric rhyolite of the Zig Zag Hill Formation, Tyndall Group, west of the Anthony Road.

Field Locality	Dip	Dip Direction
88	79	045
88	84	058
88	74	035
90	65	288
90	63	068
91	75	050
91	58	232
92	72	110
93	63	083
94	80	093
94	72	086
95	65	108
96	72	095
97	81	075
98	65	218
99	63	032
101	63	033
102	90	330
103	67	070
105	70	045
137	74	010
179	47	035
179	73	220
179	67	030
180	59	048

2. Data from domain 2

(north and east of the Great Lyell Fault)

Measurements are from the Owen Conglomerate.

Bedding

Field No.	Strike	Dip	Direction	Lithologic Association
66	152	84	W	Jukes Conglomerate
67	175	81	W	Owen Conglomerate
67	176	80	W	Owen Conglomerate
68	103	45	S	Owen Conglomerate
68	136	56	W	Owen Conglomerate
68	152	77	W	Owen Conglomerate
68	136	48	W	Owen Conglomerate
68	145	56	W	Owen Conglomerate
69	104	50	S	Lower Conglomerate
70	138	45	W	Lower Conglomerate
71	113	48	S	Middle Owen
72	131	44	S	Middle Owen
72	140	47	W	Middle Owen
73	132	48	S	Middle Owen
74	108	46	S	Lower Owen
75	123	56	S	Owen Conglomerate
75	145	54	W	Owen Conglomerate
76	190	77	W	Owen Conglomerate
76	175	67	W	Owen Conglomerate
76	145	65	W	Owen Conglomerate
77	142	47	W	Owen Conglomerate
77	135	55	W	Owen Conglomerate
77	127	50	S	Owen Conglomerate
78	103	57	S	Owen Conglomerate
79	138	37	W	Owen Conglomerate
80	140	46	W	Owen Conglomerate
80	150	64	W	Owen Conglomerate
80	154	67	W	Owen Conglomerate
81	154	74	W	Newton Creek Sandstone
82	160	70	W	Newton Creek Sandstone
84	014	70	E	Owen Conglomerate
84	013	77	E	Owen Conglomerate
60	165	78	W	Jukes Conglomerate
60	165	65	W	Jukes Conglomerate
61	140	72	W	Owen Conglomerate
61	143	69	W	Owen Conglomerate
61	132	60	S	Owen Conglomerate
61	138	50	W	Owen Conglomerate
61	143	73	W	Owen Conglomerate
61	144	71	W	Owen Conglomerate
61	330	75	E	Owen Conglomerate
61	145	79	W	Owen Conglomerate

62	309	72	E	Jukes Conglomerate
63	156	85	S	Newton Creek Sandstone
64	154	69	W	Owen Conglomerate
65	352	74	E	Owen Conglomerate
65	351	82	E	Owen Conglomerate
65	006	74	E	Owen Conglomerate
38	178	30	W	Middle Owen
47	182	40	W	Newton Creek Sandstone
47	175	34	W	Newton Creek Sandstone
50	150	35	W	Owen Conglomerate
51	140	48	E	Lower Conglomerate
51	137	54	W	Lower Conglomerate
52	123	46	S	Lower Conglomerate
52	135	53	W	Lower Conglomerate
52	125	47	S	Lower Conglomerate
53	144	61	W	Lower Conglomerate
116	146	67	W	Owen Conglomerate
116	145	83	W	Owen Conglomerate
117	334	84	E	Newton Creek Sandstone
118	140	77	W	Newton Creek Sandstone
-	326	88	E	
118	140	51	W	Newton Creek Sandstone
118	138	79	W	Newton Creek Sandstone
118	132	85	S	Newton Creek Sandstone
138	175	57	W	Newton Creek Sandstone
138	188	47	W	Newton Creek Sandstone
139	335	70	E	Newton Creek Sandstone
139	150	85	W	Newton Creek Sandstone
139	162	86	W	Newton Creek Sandstone
141	355	55	E	Newton Creek Sandstone
142	002	76	E	Newton Creek Sandstone
142	150	55	E	Newton Creek Sandstone
143	155	72	W	Newton Creek Sandstone
143	345	63	W	Newton Creek Sandstone
143	352	74	E	Newton Creek Sandstone
143	155	67	E	Newton Creek Sandstone
144	145	60	W	Owen Conglomerate
145	145	64	W	Owen Conglomerate
146	353	76	W	Owen Conglomerate
147	006	40	E	Owen Conglomerate
149	354	65	E	Newton Creek Sandstone
152	145	65	E	Newton Creek Sandstone
153	148	52	W	Newton Creek Sandstone
154	325	72	W	Newton Creek Sandstone
154	148	51	E	Newton Creek Sandstone
155	160	55	W	Newton Creek Sandstone
156	165	72	W	Newton Creek Sandstone
157	322	42	W	Newton Creek Sandstone
158	140	72	E	Newton Creek Sandstone
159	140	35	W	Newton Creek Sandstone
160	150	45	W	Newton Creek Sandstone
160	165	58	W	Newton Creek Sandstone
161	140	54	W	Newton Creek Sandstone
162	148	62	W	Newton Creek Sandstone
163	145	55	W	Newton Creek Sandstone
164	132	58	W	Newton Creek Sandstone

165	186	62	S	Newton Creek Sandstone
166	350	62	W	Newton Creek Sandstone
167	172	60	E	Newton Creek Sandstone
168	168	84	W	Newton Creek Sandstone
169	140	63	W	Newton Creek Sandstone
170	145	79	W	Newton Creek Sandstone
171	359	77	W	Newton Creek Sandstone
172	315	40	E	Owen Conglomerate
173	151	65	E	Jukes Conglomerate
173	157	80	W	Jukes Conglomerate
173	155	75	W	Jukes Conglomerate
177	168	70	W	Newton Creek Sandstone
178	172	54	W	Newton Creek Sandstone
Canal	111	38	W	Newton Creek Sandstone
Canal	110	42	S	Newton Creek Sandstone
Canal	112	45	S	Newton Creek Sandstone
-	150	40	S	
-	335	49	S	
231	155	55	E	Newton Creek Sandstone
231	110	55	S	Newton Creek Sandstone
231	110	54	S	Newton Creek Sandstone
231	116	47	S	Newton Creek Sandstone
232	132	49	S	Newton Creek Sandstone
233	130	53	S	Newton Creek Sandstone
233	128	49	S	Newton Creek Sandstone
234	130	50	E	Newton Creek Sandstone
235	135	53	W	Newton Creek Sandstone
235	145	56	W	Newton Creek Sandstone
236	130	45	S	Newton Creek Sandstone
236	340	84	E	Newton Creek Sandstone
236	345	83	E	Newton Creek Sandstone
236	161	51	W	Newton Creek Sandstone
236	135	50	W	Newton Creek Sandstone
236	012	52	E	Newton Creek Sandstone
236	023	48	E	Newton Creek Sandstone
236	152	52	W	Newton Creek Sandstone
237	144	54	W	Newton Creek Sandstone

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Field No.	Strike	Dip	Direction	Lithologic Association
118	325	83	E	Newton Creek Sandstone
171	125	73	S	Newton Creek Sandstone
79	005	80	E	Newton Creek Sandstone
79	165	84	W	Newton Creek Sandstone
79	138	37	W	Newton Creek Sandstone
81	154	74	W	Newton Creek Sandstone
82	160	70	W	Newton Creek Sandstone

S2

Field No.	Strike	Dip	Direction	Lithologic Association
60	165	78	W	Jukes Conglomerate
60	165	65	W	Jukes Conglomerate
65	162	84	W	Owen Conglomerate
67	174	76	W	Owen Conglomerate
-	123	56	S	
156	145	54	W	Newton Creek Sandstone
76	190	77	W	Owen Conglomerate
76	175	67	W	Owen Conglomerate
76	145	65	W	Owen Conglomerate
80	305	57	E	Owen Conglomerate
80	155	85	W	Owen Conglomerate
80	150	86	W	Owen Conglomerate
83	180	72	S	Owen Conglomerate
83	182	64	W	Owen Conglomerate
84	330	61	E	Owen Conglomerate
117	130	65	W	Newton Creek Sandstone
118	140	77	W	Newton Creek Sandstone
142	250	71	W	Newton Creek Sandstone
142	317	80	E	Newton Creek Sandstone
144	132	65	W	Owen Conglomerate
152	317	75	N	Newton Creek Sandstone
171	172	78	W	Newton Creek Sandstone
178	338	83	N	Newton Creek Sandstone
231	288	58	E	Newton Creek Sandstone
232	325	63	N	Newton Creek Sandstone
233	120	64	E	Newton Creek Sandstone
234	318	70	W	Newton Creek Sandstone
236	315	78	E	Newton Creek Sandstone
236	155	79	E	Newton Creek Sandstone
236	165	81	S	Newton Creek Sandstone
236	150	67	W	Newton Creek Sandstone
236	175	78	S	Newton Creek Sandstone
237	148	73	W	Newton Creek Sandstone
79	125	58	W	Newton Creek Sandstone
79	140	51	S	Newton Creek Sandstone
79	158	75	W	Newton Creek Sandstone
82	098	26	W	Newton Creek Sandstone

S3

Field No.	Strike	Dip	Direction	Lithologic Association
76	235	55	N	Newton Creek Sandstone
76	225	70	N	Newton Creek Sandstone
76	226	58	N	Newton Creek Sandstone

3. Faults

Fault planes

Field No.	Strike	Dip	Direction	Movement
203	335	75	E	
204	145	85	W	
215	321	55	E	
221	139	85	W	dextral reverse
222	108	72	W	normal
225	282	72	E	normal
226	155	73	W	sinistral reverse
226	330	85	E	
227	152	76	W	
228	319	70	E	
228	164	80	W	
230	030	52	E	dextral reverse
231	110	55	W	sinistral reverse/dextral reverse GLF
231	110	54	W	sinistral reverse/dextral reverse GLF
233	140	46	W	dextral reverse
235	145	56	W	reverse
236	35	80	E	
238	148	73	W	sinistral
241	003	53	E	reverse
253	145	82	W	
253	015	62	E	reverse
256	273	76	E	reverse
258	120	87		W
259	065	50	E	dextral reverse(Newton Dam Spillway)
266	145	82	W	
Canal	065	84	E	sinistral reverse
292	115	85	W	normal
-	40	58	E	reverse (Spillway)
29	300	62	E	
30	348	70	E	
138	140	65	W	
139	335	70	E	sinistral reverse
196	135	45	W	
-	280	76	E	
-	346	66	E	
-	147	84	W	

Striation data from the Great Lyell Fault

Lineation data for quartz-chlorite fibre veins, developed on bedding planes in the Newton Creek Sandstone, from the Great Lyell Fault close to the Howards Road - Anthony Road junction. There are two generations of lineations. Generation 1 (G1) has a sinistral reverse sense of movement and is overprinted by generation 2 (G2) which has a dextral reverse sense of movement.

Field Locality	Generation	Trend	Plunge
231	G1	245°	45°
231	G2	165°	49°
231	G1	242°	45°
231	G2	186°	53°
233	G2	218°	45°

APPENDIX C

CARBON-OXYGEN ISOTOPES

1. **Analytical methods**

2. **Sample localities, descriptions and results**

3. **Discussion of carbon and oxygen isotopes from limestone in the Anthony Road Andesite and Lynchford Member of the Tyndall Group within the Basin Lake area**

(Sample powders housed within the Geology Department rock store, University of Tasmania)

1. Analytical methods

All carbon and oxygen stable isotope measurements used during this study were conducted in the Central Science Laboratory, University of Tasmania, using a VG SIRA series 2 mass spectrometer following the methods of McCrea (1950). Carbonates were reacted with phosphoric acid (H_3PO_4) at 50°C for 24 hours. Oxygen isotope ratios were recalculated to 25°C by adding a standard 0.04‰ for each degree celsius the reaction occurred at above 25°C. Isotope ratios for ^{18}O and ^{13}C are expressed using δ notation, in parts per mil (‰). The carbon standard used is the PDB standard (from the belemnite *Belemnitella americana* of the Pee Dee Formation, South Carolina) while the oxygen standard used is Standard Mean Ocean Water (SMOW). Mike Power and Christine Cook carried out all analytical work.

2. Sample localities, descriptions and results

	A	B	C	D	E	F	G	H	I
1	**2.Sample localities, descriptions and results**								
2									
3	**Depart. Cat. No.**	**Field Sample No.**	**Location**	**Depth (m)**	**Sample Coordinates**	**Description of Carbonate**	**∂13CPDB**	**∂180PDB**	**∂18OSMOW**
4	131888	TYN3-1	drillhole TYN3	143.56	380570mE, 5356630mN	banded white-green	1.374	-15.538	14.811
5	131889	TYN3-2	TYN3	143.56	380570mE, 5356630mN	massive white crystals	1.248	-15.892	14.447
6	131890	TYN3-3	TYN3	149.66	380570mE, 5356630mN	white carbonate between andesite	1.247	-14.361	16.025
7	131891	TYN3-4	TYN3	149.66	380570mE, 5356630mN	white carbonate between andesite	0.844	-13.371	17.045
8	131892	TYN3-5	TYN3	196.44	380570mE, 5356630mN	white	1.064	-14.706	15.669
9	131893	TYN3-6	TYN3	209.4	380570mE, 5356630mN	white	1.22	-12.422	18.024
10	131894	TYN3-7	TYN3	220.22	380570mE, 5356630mN	white-green	1.022	-14.736	15.638
11	131895	TYN3-8	TYN3	236.2	380570mE, 5356630mN	white-grey	1.152	-15.485	14.866
12	131896	TYN3-9	TYN3	244.9	380570mE, 5356630mN	grey-white	-0.91	-15.949	14.388
13	131897	HA1-10	HA1	128.4	380791.657mE, 5357429.890mN	white carbonate through hematite	-0.116	-17.411	12.881
14	131898	HA2-11	HA2	53.2	380791.657mE, 5357429.890mN	white	0.327	-16.302	14.024
15	131899	HA2-12	HA2	53.2	380791.657mE, 5357429.890mN	grey (fine grained)	0.343	-16.166	14.164
16	131900	HA2-13	HA2	57	380791.657mE, 5357429.890mN	white	1.057	-15.84	14.5
17	131901	HA2-14	HA2	90.2	380791.657mE, 5357429.890mN	wh fine grained vein in Ab/Ep alteration	-0.12	-17.234	13.064
18	131902	HA2-15	HA2	90.2	380791.657mE, 5357429.890mN	grey fine grained (epidote-albite alteration	0.3	-17.164	13.125
19	131903	HA2-16	HA2	123.5	380791.657mE, 5357429.890mN	white vein	-0.676	-17.794	12.487
20	131904	HA2-17	HA2	179.1	380791.657mE, 5357429.890mN	white vein	0.13	-17.394	12.898
21	131905	HA3-18	HA3	204.6	380986.991mE, 5358154.820mN	orange massive	1.124	-14.123	16.27
22	131906	HA3-19	HA3	205.5	380986.991mE, 5358154.820mN	orange-white banded	1.107	-13.949	16.45
23	131907	HA3-20	HA3	205.5	380986.991mE, 5358154.820mN	white vein	0.947	-13.922	16.478
24	131908	HA3-21	HA3	211.7	380986.991mE, 5358154.820mN	white to light green massive	1.374	-13.129	17.295
25	131909	HA3-22	HA3	221.95	380986.991mE, 5358154.820mN	white-green massive	1.446	-14.266	16.123
26	131910	HA3-23	HA3	223.1	380986.991mE, 5358154.820mN	light green massive	1.495	-13.656	16.751

2.Sample localities, descriptions and results (cont.)								
Depart. Cat. No.	**Sample No.**	**Location**	**Depth (m)**	**Sample Coordinates**	**Description of Carbonate**	**∂13CPDB**	**∂18OPDB**	**∂18OSMOW**
131911	HA3-24	HA3	223.1	380986.991mE, 5358154.820mN	purple band	1.354	-13.846	16.555
131912	HA4-25	HA4	225.2	380907.089mE, 5357523.960mN	white	1.518	-15.11	15.253
131913	HA4-26	HA4	305.8	380907.089mE, 5357523.960mN	white massive with hematite bits	1.677	-15.187	15.173
131914	HA4-27	HA4	350.9	380907.089mE, 5357523.960mN	white-orange banded	0.977	-15.492	14.859
131915	HA4-28	HA4	359.6	380907.089mE, 5357523.960mN	white massive	0.966	-15.061	15.303
131916	HA4-29	HA4	397.3	380907.089mE, 5357523.960mN	grey massive fine grained	0.382	-16.481	13.839
131917	HA4-30	HA4	397.3	380907.089mE, 5357523.960mN	white massive	0.708	-16.512	13.807
131918	HA6-31	HA6	70.05	381038.031mE, 5357690.200mN	white-orange band with quartz	0.85	-14.86	15.511
131919	HA6-32	HA6	112.7	381038.031mE, 5357690.200mN	white band	1.395	-15.304	15.053
131920	HA6-33	HA6	112.7	381038.031mE, 5357690.200mN	purple band	1.192	-15.007	15.359
131921	HA6-34	HA6	178.2	381038.031mE, 5357690.200mN	white	1.202	-13.922	16.477
131922	BL3-35	BL3	61.85	380985mE, 5353990mN	white-grey massive	0.906	-15.996	14.34
131923	BL3-36	BL3	61.85	380985mE, 5353990mN	purple band	0.954	-15.84	14.5
131924	BL3-37	BL3	125.23	380985mE, 5353990mN	white	1.491	-16.653	13.662
131925	BL3-38	BL3	125.23	380985mE, 5353990mN	purple-pink	0.992	-16.921	13.386
131926	9.-3/94	ARoad	surface	379659mE, 5354930mN	white carbonate in andesite	1.852	-18.062	12.24
131927	30a-11/94	ARoad	surface	380600mE, 5355540mN	white carbonate in andesite(albite rim)	-1.994	-16.386	13.965
131928	30b-11/94	ARoad	surface	380600mE, 5355540mN	white calcite in andesite(albite rim)	-2.688	-16.657	13.689
131929	30c-11/94	ARoad	surface	380600mE, 5355540mN	white calcite in andesite(fault plane)	-2.152	-14.827	15.575

3. Discussion of carbon and oxygen isotopes from limestone in the Anthony Road Andesite and Lynchford Member of the Tyndall Group within the Basin Lake area

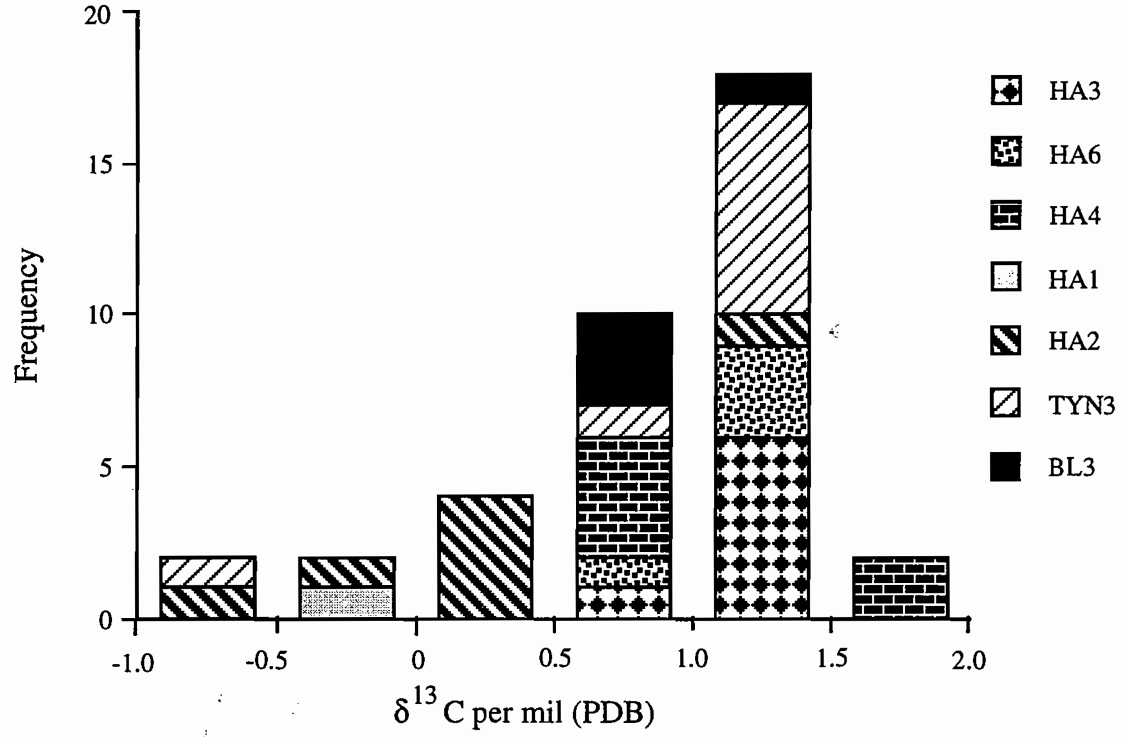
Massive to bedded limestone lenses occur in the upper Anthony Road Andesite and at the base of the Lynchford Member (Tyndall Group) in the Basin Lake area. The occurrence of carbonate in the Howards Anomaly area has previously been interpreted by Purvis et al. (1983) as either a sedimentary limestone or a hydrothermal carbonate deposited from exhaling hydrothermal fluids. Carbonate occurring at the base of the Tyndall Group near the Henty Mine (2 km north) is interpreted to be exhalative in origin, precipitating from hot seawater (Halley and Roberts, 1997). Carbonate occurrences at Henty have three similarities with limestone in the Basin Lake area: 1. multiple lenses; 2. presence of ironstone fragments and 3. presence of possible fossil fragments (Halley and Roberts, 1997).

Carbonate of three distinct origins is known to occur in the Mount Read Volcanics: 1. Cambrian sedimentary carbonate; 2. Cambrian hydrothermal carbonate and 3. Devonian metamorphic/magmatic carbonate.

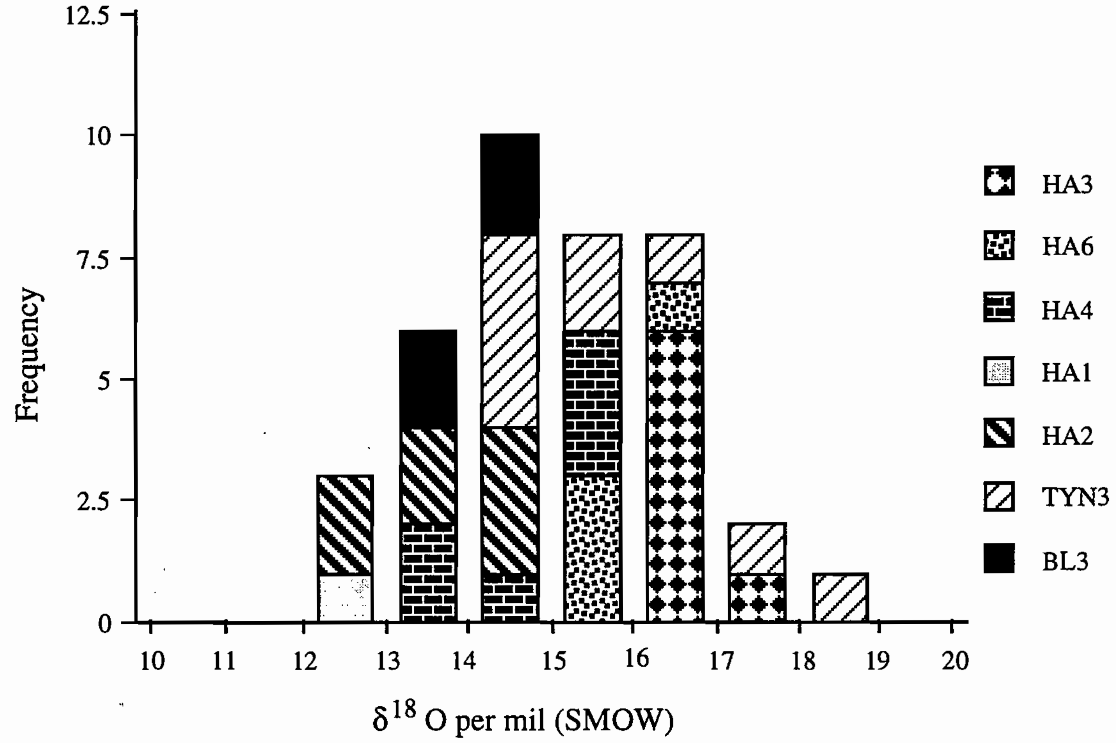
Carbon - oxygen isotopes

The 38 carbonate samples analysed from the study area show a range in $\delta^{13}C$ (PDB) values from -0.9‰ to +1.5‰ (mean +0.8‰), while $\delta^{18}O$ (SMOW) values range from +12.4‰ to +18‰ (mean +15‰; Appendix C). Histograms of $\delta^{13}C$ (PDB) and $\delta^{18}O$ (SMOW) values from the different sampled drillholes across the study area are given.

It is probable that recrystallisation of limestone occurred during burial diagenesis or later during regional metamorphism. During diagenesis, recrystallisation of the limestone most likely occurred in the presence of fluids similar in character to the primary fluids, thus allowing little isotopic exchange. Sheppard and Schwarcz (1970) have shown that carbon and oxygen isotope ratios in carbonates can remain stable during metamorphism at temperatures in excess of 400°C. Despite subsequent recrystallisation, the carbon - oxygen isotope ratios are interpreted to reflect primary Cambrian isotopic values.



Histogram showing $\delta^{13}C$ values of carbonates in different drillholes from across the study area. Drillholes are arranged from the most northern (HA3) to the most southern (BL3).



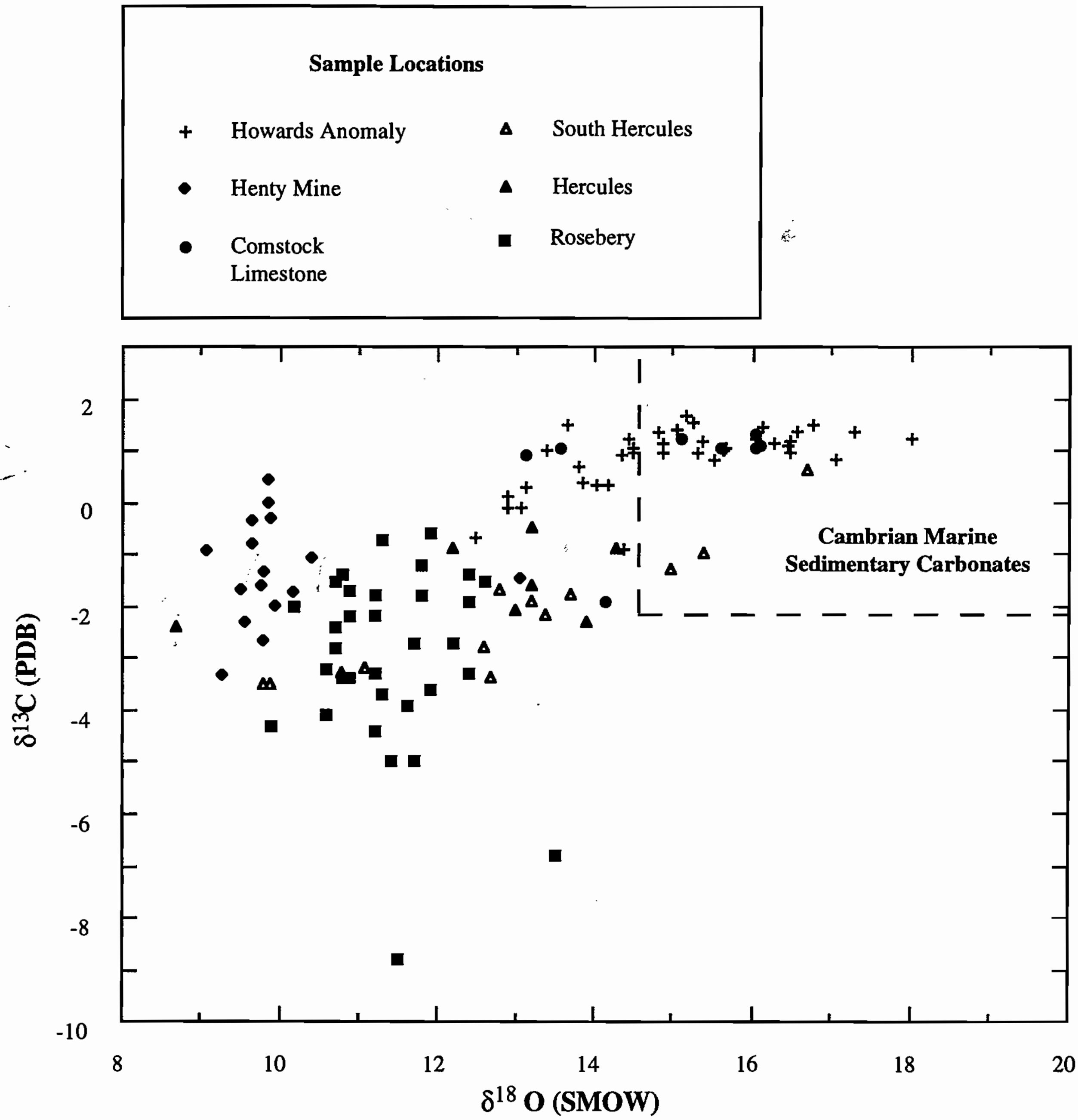
Histogram of $\delta^{18}O$ values of carbonates from different drillholes across the study area. Drillholes arranged north to south (HA3 to BL3).

In the Mount Read Volcanics, hydrothermal carbonate is relatively common (especially related to Cambrian mineralisation), while Cambrian sedimentary carbonate is uncommon with only two recorded examples: 1. the fossiliferous Comstock Limestone and 2. fossiliferous limestone clasts from the Cradle Mountain Link Road (Jago et al., 1972; MacDonald, 1991).

Keith and Weber (1964) and Veizer and Hoefs (1976) have studied sedimentary carbonates of differing geological ages. Their work defines a field of values for Cambrian sedimentary carbonate in the range $\delta^{13}C$ (PDB) -2.5‰ to +2.5‰ and $\delta^{18}O$ (SMOW) +14.37‰ to +24.00‰ (Keith and Weber, 1964; Veizer and Hoefs, 1976). A field of carbon and oxygen isotope values for Cambrian hydrothermal carbonate can also be established by combining data on hydrothermal carbonates from the Rosebery (Dixon, 1980; Khin Zaw, 1991), Hercules (Khin Zaw, 1991), South Hercules (Khin Zaw, 1991) and Henty (Yeats, 1989; Halley and Roberts, 1997) Cambrian VHMS deposits. Carbonate at the Hellyer and Rosebery VHMS deposits is alteration related, formed by replacement, whereas carbonate at Henty is exhalative (Large, 1992; Halley and Roberts, 1997).

A plot of $\delta^{13}C$ (PDB) vs $\delta^{18}O$ (SMOW) for carbonates from the study area, combined with data from the Comstock Limestone (MacDonald, 1991), data from Cambrian hydrothermal carbonates and showing the field for Cambrian marine sedimentary carbonates is given.

The limestone from the study area has C-O isotope characteristics almost equivalent to those of the Comstock Limestone near Queenstown and different from carbonate alteration occurring at VHMS deposits in the belt. The lightest $\delta^{13}C$ (PDB) and $\delta^{18}O$ (SMOW) values in the study area come from drillholes HA1 and HA2 which are drilled near Cambrian age base and precious metal-rich vein mineralisation which outcrops in Tyndall Creek. The presence of some relatively light $\delta^{13}C$ (PDB; i.e., -0.9‰) and $\delta^{18}O$ (SMOW; i.e., +12.4‰) values may indicate partial hydrothermal sourcing of carbonate in the Basin Lake area. The thick nature of the carbonate lenses, the presence of possible relic fossils, presence of ironstone fragments and the occurrence of separate lenses of carbonate at different stratigraphic levels indicate that limestone in the Basin Lake area was deposited on the seafloor over a prolonged time period.



Plot of $\delta^{13}C$ vs $\delta^{18}O$ for the Mount Read Volcanics. Data from Khin Zaw (1991), MacDonald (1991), Yeats (1989), Dixon (1980), this study. Field of Cambrian marine sedimentary carbonates from Veizer and Hoefs (1976).

APPENDIX D

ELECTRON MICROPROBE DATA

1. Analytical Methods/ Data Recalculation Methods

2. Microprobe Data
   - Clinopyroxene
   - Amphibole
   - Magnetite
   - Apatite
   - Cr-Spinel
   - Chlorite

1. Analytical Methods/ Data Recalculation Methods

All mineral phases were analysed at the Central Science Laboratory, University of Tasmania on a Cameca SX50 electron microprobe. The micrprobe was operated by Mr Wieslaw Jablonski. Internal university standards have been used to ensure analytical precision. Electron microprobe analyses of clinopyroxenes have been stoichiometrically recalculated on the basis of six oxygens and four cations using the recalculation program Mintab (Rock and Carroll, 1990; Deer et al., 1992). P_2O_5 has been removed during recalculation as apatite. All amphibole analyses have been recalculated stoichiometrically on the basis of 13 cations (where 13 = Si+Ti+Al+Fe+Mn+Mg) excluding Ca, Na and K based on the recommendations of a pilot study of amphibole recalculation methods by Cosca et al.(1991). Probe analyses of magnetite have been recalculated stoichiometrically on the basis of 32 oxygens and 24 cations following the recommendations of Deer et al. (1992) using the Macintosh application Mintab (Rock and Carroll, 1990). Analyses of apatite have been calculated on the basis of 26 (O, OH, F, Cl) by electron microprobe. Microprobe analyses of Cr-spinels have been recalculated on the basis of 32 oxygens and 24 cations following the recommendations of Deer et al. (1992), using the recalculation application Mintab (Rock and Carroll, 1990). Chlorite analyses were recalculated using Mintab on the basis of 28 oxygens (Offler and Whitford, 1992).

2. Microprobe Data

- Clinopyroxene
- Amphibole
- Magnetite
- Apatite
- Cr-Spinel
- Chlorite

Clinopyroxenes													
Clinopyroxenes analysed from lavas/shallow intrusions of the feldspar-hornblende													
andesite/dacite association of the Anthony Road Andesite													
	TS 624446 (Aberfoyle collection Burnie)			TS 75838 (Gibson, 1991)									
sample	FdHblR2 CPX2	R8 CPX2	R9 CPX2 RIM	R11 CPX1	R11 CPX2	R11 CPX3	R12 CPX1	R12 CPX2	R14 CPX1	R14 CPX2	R19 CPX1	R21 CPX2	R23 CPX1
(wt%)													
Na2O	0.16	0.16	0.19	0.13	0.13	0.19	0.21	0.13	0.19	0.23	0.11	0.16	0.17
MgO	17.01	16.53	16.46	17.92	17.09	15.18	15.18	16.87	15.99	15.06	18.1	16.99	16.97
Al2O3	1.9	2.2	2.78	0.93	1.86	1.78	3.34	1.72	2.75	3.27	1.09	1.68	2.31
SiO2	51.77	51.55	50.93	52.5	51.67	51.37	49.99	51.8	50.55	49.5	52.5	52.34	51.38
P2O5	0.39	0.35	0.37	0.31	0.32	0.31	0.36	0.32	0.37	0.38	0.33	0.33	0.33
S	•	0.01	0.04	0.02	0.109	0.049	0.059	0.049	0.069	•	•	0.02	0.059
Cl	•	0	0.02	•	0.02	0.04	•	0.02	•	0	•	0.01	0.02
K2O	•	0.01	0.02	0	0	0.01	•	0	0.01	0.01	•	0	•
CaO	22.59	22.49	20.97	21.71	21.32	21.71	20.54	21.44	21.01	20	21.88	21.83	20.75
TiO2	0.17	0.23	0.38	0.11	0.17	0.19	0.39	0.17	0.32	0.38	0.07	0.12	0.23
Cr2O3	0.33	0.23	0.08	0.44	0.41	0.28	0.07	0.24	0.07	0	0.47	0.13	0.36
MnO	0.11	0.13	0.31	0.08	0.19	0.36	0.2	0.17	0.27	0.23	0.23	0.17	0.24
FeO	4.542	5.004	6.286	4.519	5.581	7.685	8.007	5.946	6.624	8.294	4.037	5.767	6.003
Fe2O3	0.224	0.119	0.203	0.254	0.017	0.466	0.613	0.405	0.838	1.37	0.517	0.049	0.397
NiO	0.01	0.04	0.08	•	0.01	0.08	•	0.04	•	•	•	•	0.05
Total	99.22	99.05	99.05	98.9	98.79	99.63	98.89	99.26	98.97	98.74	99.33	99.58	99.22
(cations)													
Si	1.921	1.918	1.901	1.947	1.926	1.924	1.884	1.927	1.895	1.875	1.938	1.937	1.911
Al	0.083	0.097	0.122	0.041	0.082	0.078	0.148	0.075	0.122	0.146	0.047	0.073	0.101
Fe3	0.006	0.003	0.006	0.007	0	0.013	0.017	0.011	0.024	0.039	0.014	0.001	0.011
Fe2	0.141	0.156	0.196	0.14	0.174	0.241	0.252	0.185	0.208	0.263	0.125	0.178	0.187
Mg	0.941	0.917	0.916	0.991	0.95	0.847	0.853	0.936	0.894	0.85	0.996	0.937	0.941
Ca	0.878	0.878	0.82	0.846	0.835	0.855	0.811	0.838	0.824	0.791	0.848	0.848	0.81
Na	0.012	0.012	0.013	0.009	0.009	0.014	0.015	0.01	0.014	0.017	0.008	0.011	0.012
K	0	0	0.001	0	0	0.001	0	0	0	0	0	0	0
Ti	0.005	0.006	0.011	0.003	0.005	0.005	0.011	0.005	0.009	0.011	0.002	0.003	0.007
P	0.012	0.011	0.012	0.01	0.01	0.01	0.011	0.01	0.012	0.012	0.01	0.01	0.01
Mn	0.003	0.004	0.01	0.003	0.006	0.011	0.006	0.005	0.009	0.007	0.007	0.005	0.008
Cr	0.01	0.007	0.002	0.013	0.012	0.008	0.002	0.007	0.002	0	0.014	0.004	0.01
Ni	0	0.001	0.002	0	0	0.002	0	0.001	0	0	0	0	0.002
100Mg#	86.976	85.48	82.354	87.605	84.516	77.875	77.16	83.492	81.143	76.394	88.877	84.007	83.443
Enstatite	48.021	47	47.413	50.104	48.492	43.617	44.51	47.77	46.409	44.641	50.582	47.726	48.568
Ferrosilite	7.191	7.984	10.159	7.089	8.884	12.392	13.175	9.445	10.785	13.795	6.33	9.086	9.637
Wollastonite	44.788	45.016	42.428	42.807	42.624	43.991	42.315	42.785	42.807	41.565	43.088	43.188	41.796
FeO & Fe2O3 calculated stoichiometrically based on 6[O] and 4 cations.													
Mg# = Mg/(Mg + Fe2)													

Clinopyroxenes								
Clinopyroxenes analysed from lavas of the pyroxene-feldspar basaltic andesite								
association of the Anthony Road Andesite								
Dept. Cat. No.	131856						131855	
Field No.	TS BL4 199.55m						TS BL4 198.8m	
sample	PxFdR2 CPX2 RIM	R3 CPX1	R7 CPX	R7 CPX2	R8 CPX1		R6 CPX	
(wt%)								
Na2O	0.28	0.24	0.21	0.21	0.17		0.26	
MgO	13.32	14.1	13.8	13.98	17.49		13.18	
Al2O3	0.94	0.85	1.14	1.08	2.49		1.34	
SiO2	51.71	51.77	51.46	51.52	51.68		50.81	
P2O5	0.29	0.4	0.33	0.29	0.33		0.38	
S	0.098	0.01	0.039	0.059	0.01		0.078	
Cl	0.01	0.02	0.03	•	0.01		•	
K2O	•	•	0	0.02	•		0.01	
CaO	22.22	22.41	21.22	22.06	21.36		21.64	
TiO2	0.15	0.2	0.2	0.16	0.27		0.19	
Cr2O3	•	0.11	•	0.08	0.79		•	
MnO	0.57	0.21	0.35	0.48	0.16		0.57	
Fe2O3	0.719	0.502	0.32	0.982	0.704		0.455	
FeO	9.85	9.624	10.935	9.032	4.771		10.444	
NiO	•	0.04	•	•	•		•	
Total	100.05	100.46	99.99	99.89	100.22		99.27	
(Cations)								
Si	1.951	1.943	1.944	1.941	1.898		1.937	
Al	0.042	0.038	0.051	0.048	0.108		0.06	
Fe3	0.02	0.014	0.009	0.028	0.019		0.013	
Fe2	0.311	0.302	0.345	0.285	0.147		0.333	
Mg	0.749	0.789	0.777	0.785	0.957		0.749	
Ca	0.883	0.88	0.841	0.875	0.824		0.864	
Na	0.021	0.017	0.016	0.016	0.012		0.019	
K	0	0	0	0.001	0		0	
Ti	0.004	0.006	0.006	0.005	0.007		0.005	
P	0.009	0.013	0.011	0.009	0.01		0.012	
Mn	0.018	0.007	0.011	0.015	0.005		0.019	
Cr	0	0.003	0	0.002	0.023		0	
Ni	0	0.001	0	0	0		0	
100Mg#	70.68	72.315	69.222	73.395	86.727		69.228	
Enstatite	38.558	40.024	39.572	40.377	49.666		38.506	
Ferrosilite	15.995	15.323	17.595	14.637	7.601		17.116	
Wollastonite	45.447	44.653	42.834	44.986	42.732		44.378	
FeO & Fe2O3 calculated stoichiometrically based on 6[O] and 4 cations.								
Mg# = Mg/(Mg + Fe2)								

Amphiboles						
Amphiboles analysed from lavas/shallow intrusions of the feldspar-hornblende andesite/dacite association of the						
	TS 624352 (Aberfoyle collection Burnie)					
Sample	624352 R1 AM	R1 AMP2	R1 AMP3	R2 AMP1??	R2 AMPH2??	R2 AMP3
(wt%)						
SiO2	48.923	48.506	48.825	40.08	41.904	48.523
TiO2	1.28	1.445	1.478	0.021	0	1.216
Al2O3	7.105	7.608	7.278	22.53	22.924	7.46
FeO	15.741	15.426	15.65	14.235	12.903	16.024
MnO	0.207	0.349	0.326	0.145	0.041	0.313
MgO	13.486	13.283	13.326	0.201	0.265	13.266
CaO	11.064	11.085	10.978	22.749	21.539	10.955
Na2O	1.282	1.329	1.288	0.006	0.024	1.249
K2O	0.582	0.602	0.577	0	0.321	0.616
Cl	0.311	0.334	0.23	0.015	0.025	0.296
F	0.156	0.164	0.163	0	0.102	0.202
(cations)						
(T site)						
Si	6.94	6.89	6.92	6.60	6.80	6.88
Al	1.06	1.11	1.08	1.40	1.20	1.12
Fe3+	0.00	0.00	0.00	0.00	0.00	0.00
Sum in T	8.00	8.00	8.00	8.00	8.00	8.00
(C site)						
Al	0.12	0.16	0.13	2.97	3.18	0.13
Fe3+	0.85	0.80	0.84	(5.59)	(5.54)	0.95
Ti	0.14	0.15	0.16	0.00	0.00	0.13
Mg	2.85	2.81	2.81	0.05	0.06	2.80
Fe2+	1.02	1.04	1.01	7.55	7.29	0.95
Mn	0.02	0.04	0.04	0.02	0.01	0.04
Ca	0.00	0.00	0.00	0.00	0.00	0.00
Sum in C	5.00	5.00	5.00	5.00	5.00	5.00
(B site)						
Fe2+	0.00	0.00	0.00	0.00	0.00	0.00
Mn	0.00	0.00	0.00	0.00	0.00	0.00
Ca	1.68	1.69	1.67	2.00	2.00	1.66
Na	0.32	0.31	0.33	0.00	0.00	0.34
Sum in B	2.00	2.00	2.00	2.00	2.00	2.00
(A site)						
Ca	0.00	0.00	0.00	2.01	1.74	0.00
Na	0.03	0.05	0.02	0.00	0.01	0.01
K	0.11	0.11	0.10	0.00	0.07	0.11
Sum in A	0.14	0.16	0.12	2.01	1.82	0.12
Cl	0.07	0.08	0.06	0.00	0.01	0.07
F	0.07	0.07	0.07	0.00	0.05	0.09
(Ca+Na)B	2.00	2.00	2.00	2.00	2.00	2.00
Mg#[Mg/Mg+Fe2+]	0.74	0.73	0.74	0.01	0.01	0.75
(Na+K)A	0.14	0.16	0.12	0.00	0.07	0.12
Recalculated on the basis of 13 cations excluding Ca, Na and K.						

Anthony Road Andesite

R2 AMP4	R3 AMP1	R3 AMP2	R3 AMP3	R3 AMP4	R4 AMP1	R4 AMP2
47.925	48.62	48.591	48.792	48.47	48.53	48.493
1.268	1.2	1.206	1.111	1.109	1.083	1.153
7.588	7.37	7.393	7.244	7.129	7.133	7.195
16.369	16.42	16.434	16.425	16.497	16.469	16.355
0.215	0.23	0.348	0.209	0.298	0.299	0.263
13.097	13.118	12.937	13.07	13.173	13.313	13.022
11.074	10.904	10.832	11.002	11.25	11.007	10.87
1.435	1.186	1.252	1.232	1.188	1.283	1.235
0.658	0.587	0.68	0.591	0.603	0.539	0.61
0.354	0.344	0.369	0.263	0.29	0.328	0.332
0.092	0.123	0.069	0.116	0.1	0.116	0.139
6.83	6.89	6.90	6.93	6.89	6.89	6.92
1.17	1.11	1.10	1.07	1.11	1.11	1.08
0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00
0.11	0.13	0.14	0.14	0.09	0.08	0.13
0.89	0.98	0.94	0.90	0.91	1.01	0.94
0.14	0.13	0.13	0.12	0.12	0.12	0.12
2.78	2.77	2.74	2.77	2.79	2.82	2.77
1.06	0.97	1.01	1.05	1.05	0.95	1.01
0.03	0.03	0.04	0.03	0.04	0.04	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.69	1.66	1.65	1.67	1.71	1.67	1.66
0.31	0.33	0.34	0.33	0.29	0.33	0.34
2.00	1.98	1.99	2.00	2.00	2.00	2.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.09	0.00	0.00	0.01	0.04	0.03	0.00
0.12	0.11	0.12	0.11	0.11	0.10	0.11
0.21	0.11	0.12	0.12	0.15	0.12	0.11
0.09	0.08	0.09	0.06	0.07	0.08	0.08
0.04	0.06	0.03	0.05	0.04	0.05	0.06
2.00	1.98	1.99	2.00	2.00	2.00	2.00
0.72	0.74	0.73	0.73	0.73	0.75	0.73
0.21	0.11	0.12	0.12	0.15	0.12	0.11

R4 AMP3	R4 AMP4	R5 AMP1	R5 AMP2	R5 AMP3	R5 AMP4	R6 AMP1
48.934	48.808	48.532	40.043	49.583	49.032	48.479
1.026	1.041	1.438	0.013	1.185	1.298	1.34
6.606	6.583	7.195	23.279	6.518	6.801	7.47
16.583	16.817	15.76	13.352	15.475	15.706	15.712
0.377	0.269	0.337	0	0.255	0.225	0.175
13.397	13.416	13.456	0	13.887	13.582	13.562
11.032	11.01	11.121	23.148	11.125	11.185	10.941
1.152	1.058	1.234	0.014	1.186	1.262	1.302
0.537	0.521	0.592	0	0.483	0.522	0.623
0.271	0.315	0.328	0	0.238	0.245	0.32
0.253	0.33	0.141	0.136	0.2	0.25	0.218
6.94	6.92	6.89	6.62	7.01	6.96	6.87
1.06	1.08	1.11	1.38	0.99	1.04	1.13
0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00
0.05	0.03	0.09	3.15	0.09	0.10	0.11
1.03	1.10	0.89	(5.97)	0.87	0.82	0.95
0.11	0.11	0.15	0.00	0.13	0.14	0.14
2.83	2.84	2.85	0.00	2.92	2.87	2.86
0.94	0.90	0.98	7.82	0.96	1.04	0.92
0.05	0.03	0.04	0.00	0.03	0.03	0.02
0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.68	1.67	1.69	2.00	1.68	1.70	1.66
0.32	0.29	0.31	0.00	0.32	0.30	0.34
1.99	1.96	2.00	2.00	2.00	2.00	2.00
0.00	0.00	0.00	2.10	0.00	0.00	0.00
0.00	0.00	0.03	0.00	0.01	0.05	0.02
0.10	0.09	0.11	0.00	0.09	0.09	0.11
0.10	0.09	0.14	2.10	0.10	0.14	0.13
0.07	0.08	0.08	0.00	0.06	0.06	0.08
0.11	0.15	0.06	0.07	0.09	0.11	0.10
1.99	1.96	2.00	2.00	2.00	2.00	2.00
0.75	0.76	0.74	0.00	0.75	0.73	0.76
0.10	0.09	0.14	0.00	0.10	0.14	0.13

R6 AMP2	R6 AMP3	R6 AMP4	R7 AMP1??	R7 AMP2??	R7 AMP3	R7 AMP4
48.144	48.154	48.332	39.616	39.741	48.245	48.379
1.518	1.506	1.449	0.005	0.015	1.449	1.363
7.748	7.482	7.514	21.715	22.989	7.523	7.493
15.07	15.743	15.328	14.452	13.871	16.064	16.047
0.244	0.307	0.242	0.072	0.08	0.163	0.268
13.614	13.458	13.822	0	0.033	13.32	13.216
11.01	11.049	11.057	22.725	23.24	10.855	11.074
1.344	1.31	1.312	0	0.004	1.314	1.234
0.636	0.632	0.538	0.021	0	0.636	0.601
0.285	0.311	0.28	0	0.01	0.315	0.333
0.141	0.163	0.279	0.025	0	0.211	0.093
6.84	6.83	6.84	6.66	6.57	6.84	6.87
1.16	1.17	1.16	1.34	1.43	1.16	1.13
0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00
0.14	0.09	0.09	2.96	3.06	0.10	0.12
0.86	0.92	0.96	(5.80)	(5.88)	0.97	0.90
0.16	0.16	0.15	0.00	0.00	0.15	0.15
2.88	2.85	2.91	0.00	0.01	2.82	2.80
0.93	0.95	0.86	7.83	7.80	0.94	1.00
0.03	0.04	0.03	0.01	0.01	0.02	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.68	1.68	1.68	2.00	2.00	1.65	1.68
0.32	0.32	0.32	0.00	0.00	0.35	0.32
2.00	2.00	2.00	2.00	2.00	2.00	2.00
0.00	0.00	0.00	2.09	2.12	0.00	0.00
0.05	0.04	0.04	0.00	0.00	0.01	0.02
0.12	0.11	0.10	0.00	0.00	0.12	0.11
0.16	0.16	0.13	2.10	2.12	0.13	0.13
0.07	0.07	0.07	0.00	0.00	0.08	0.08
0.06	0.07	0.12	0.01	0.00	0.09	0.04
2.00	2.00	2.00	2.00	2.00	2.00	2.00
0.76	0.75	0.77	0.00	0.00	0.75	0.74
0.16	0.16	0.13	0.00	0.00	0.13	0.13

R7 AMP5	R7 AMP6	R8 AMP1	R8 AMP2	R8 AMP3??	R8 AMP4??	R8 AMP5
48.119	48.935	49.483	49.631	39.621	39.955	49.369
1.361	1.32	1.097	1.111	0.006	0.03	1.252
7.644	7.104	6.371	6.415	22.623	22.808	6.684
15.734	15.61	15.589	15.761	13.762	13.794	15.56
0.24	0.157	0.41	0.232	0.045	0.06	0.332
13.321	13.669	13.968	13.979	0.097	0	13.777
11.224	10.945	11.046	10.812	22.559	23.225	10.982
1.291	1.288	1.138	1.099	0	0	1.199
0.62	0.585	0.5	0.507	0	0	0.529
0.314	0.322	0.22	0.225	0	0	0.249
0.279	0.239	0.325	0.28	0	0	0.171
6.85	6.92	6.99	6.99	6.60	6.62	6.97
1.15	1.08	1.01	1.01	1.40	1.38	1.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00
0.13	0.11	0.05	0.06	3.05	3.08	0.09
0.84	0.91	0.98	1.05	(5.71)	(5.95)	0.92
0.15	0.14	0.12	0.12	0.00	0.00	0.13
2.82	2.88	2.94	2.94	0.02	0.00	2.90
1.03	0.94	0.86	0.81	7.63	7.86	0.92
0.03	0.02	0.05	0.03	0.01	0.01	0.04
0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.71	1.66	1.67	1.63	2.00	2.00	1.66
0.29	0.34	0.31	0.30	0.00	0.00	0.33
2.00	2.00	1.98	1.93	2.00	2.00	1.99
0.00	0.00	0.00	0.00	2.03	2.12	0.00
0.07	0.01	0.00	0.00	0.00	0.00	0.00
0.11	0.11	0.09	0.09	0.00	0.00	0.10
0.18	0.12	0.09	0.09	2.03	2.12	0.10
0.08	0.08	0.05	0.05	0.00	0.00	0.06
0.13	0.11	0.15	0.12	0.00	0.00	0.08
2.00	2.00	1.98	1.93	2.00	2.00	1.99
0.73	0.75	0.77	0.78	0.00	0.00	0.76
0.18	0.12	0.09	0.09	0.00	0.00	0.10

R8 AMP6	R9 AMP1	R9 AMP2	R9 AMP3	R9 AMP4	R10 AMP1	R10 AMP2
48.016	48.915	47.849	48.718	47.886	47.343	47.041
1.394	1.524	1.023	1.459	1.55	1.8	1.839
7.574	7.134	7.797	7.713	8.004	8.163	8.38
16.219	14.75	17.77	14.85	15.357	15.74	15.91
0.243	0.186	0.297	0.217	0.239	0.256	0.254
13.3	14.171	12.187	13.708	13.556	13.204	12.855
10.973	10.957	10.688	10.964	10.98	11.069	11.131
1.268	1.438	1.258	1.404	1.431	1.435	1.459
0.608	0.548	0.714	0.624	0.635	0.678	0.709
0.338	0.261	0.372	0.306	0.341	0.292	0.329
0.186	0.228	0.174	0.18	0.156	0.148	0.054
6.82	6.91	6.83	6.89	6.79	6.73	6.72
1.18	1.09	1.17	1.11	1.21	1.27	1.28
0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00
0.08	0.09	0.14	0.17	0.12	0.10	0.13
1.01	0.87	1.06	0.81	0.92	0.88	0.81
0.15	0.16	0.11	0.16	0.17	0.19	0.20
2.81	2.98	2.59	2.89	2.86	2.80	2.74
0.92	0.87	1.06	0.95	0.90	0.99	1.09
0.03	0.02	0.04	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.67	1.66	1.63	1.66	1.67	1.69	1.70
0.33	0.34	0.35	0.34	0.33	0.31	0.30
2.00	2.00	1.98	2.00	2.00	2.00	2.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.05	0.00	0.05	0.06	0.08	0.11
0.11	0.10	0.13	0.11	0.11	0.12	0.13
0.13	0.15	0.13	0.16	0.18	0.21	0.24
0.08	0.06	0.09	0.07	0.08	0.07	0.08
0.08	0.10	0.08	0.08	0.07	0.07	0.02
2.00	2.00	1.98	2.00	2.00	2.00	2.00
0.75	0.77	0.71	0.75	0.76	0.74	0.71
0.13	0.15	0.13	0.16	0.18	0.21	0.24

R10 AMP3??	R10 AMP4??	R10 AMP5	R10 AMP6	R11 AMP1	R11 AMP2	R11 AMP3
39.676	41.688	47.125	47.693	48.226	48.527	48.765
0.064	0.018	1.763	1.609	1.353	1.446	1.362
23.091	23.584	8.716	8.208	7.421	7.244	7.193
13.752	11.549	15.677	15.53	15.991	15.871	15.671
0.076	0.012	0.266	0.242	0.098	0.165	0.239
0.07	0	12.804	13.337	13.656	13.534	13.623
22.649	22.036	11.044	10.983	10.971	10.986	10.961
0.009	0.69	1.54	1.473	1.319	1.317	1.327
0	0.032	0.696	0.621	0.605	0.591	0.554
0.022	0.01	0.302	0.301	0.276	0.325	0.272
0.06	0	0.235	0.126	0.178	0.078	0.162
6.56	6.84	6.72	6.76	6.83	6.88	6.90
1.44	1.16	1.28	1.24	1.17	1.12	1.10
0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00
3.06	3.41	0.19	0.14	0.07	0.09	0.10
(5.67)	(6.24)	0.79	0.90	1.01	0.92	0.92
0.01	0.00	0.19	0.17	0.14	0.15	0.14
0.02	0.00	2.72	2.82	2.88	2.86	2.87
7.57	7.82	1.08	0.94	0.88	0.96	0.93
0.01	0.00	0.03	0.03	0.01	0.02	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	2.00	1.69	1.67	1.66	1.67	1.66
0.00	0.00	0.31	0.33	0.34	0.33	0.34
2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.01	1.88	0.00	0.00	0.00	0.00	0.00
0.00	0.22	0.11	0.07	0.03	0.03	0.03
0.00	0.01	0.13	0.11	0.11	0.11	0.10
2.02	2.10	0.24	0.19	0.14	0.14	0.13
0.01	0.00	0.07	0.07	0.07	0.08	0.07
0.03	0.00	0.11	0.06	0.08	0.03	0.07
2.00	2.00	2.00	2.00	2.00	2.00	2.00
0.00	0.00	0.72	0.75	0.77	0.75	0.76
0.00	0.23	0.24	0.19	0.14	0.14	0.13

R11 AMP4	R12 AMP1	R12 AMP2??	R12 AMP3	R12 AMP4	R12 AMP5	R13 AMP1
47.834	48.633	57.192	47.604	48.193	48.661	48.315
1.278	1.347	0.057	1.677	1.636	1.52	1.474
7.829	7.277	16.434	8.265	7.973	7.707	7.607
15.391	15.63	9.484	15.397	15.21	14.516	15.477
0.242	0.345	0.142	0.21	0.21	0.319	0.215
13.436	13.636	0.089	13.372	13.405	13.988	13.235
10.772	10.897	16.487	10.95	10.952	11.031	10.895
1.351	1.241	0.01	1.448	1.447	1.341	1.346
0.681	0.621	0.008	0.678	0.631	0.547	0.638
0.37	0.277	0.014	0.352	0.299	0.287	0.325
0.039	0.273	0.119	0.218	0.172	0.212	0.172
6.82	6.88	8.77	6.76	6.83	6.86	6.88
1.18	1.12	(0.77)	1.24	1.17	1.14	1.12
0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	8.00	8.00	8.00	8.00	8.00	8.00
0.14	0.09	3.74	0.14	0.17	0.15	0.16
0.97	0.99	(5.94)	0.89	0.82	0.87	0.82
0.14	0.14	0.01	0.18	0.17	0.16	0.16
2.86	2.87	0.02	2.83	2.83	2.94	2.81
0.87	0.86	7.16	0.93	0.99	0.85	1.02
0.03	0.04	0.02	0.03	0.03	0.04	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.65	1.65	2.00	1.67	1.66	1.67	1.66
0.35	0.34	0.00	0.33	0.34	0.33	0.34
2.00	1.99	2.00	2.00	2.00	2.00	2.00
0.00	0.00	0.71	0.00	0.00	0.00	0.00
0.02	0.00	0.00	0.06	0.06	0.03	0.04
0.12	0.11	0.00	0.12	0.11	0.10	0.12
0.14	0.11	0.71	0.19	0.18	0.13	0.15
0.09	0.07	0.00	0.08	0.07	0.07	0.08
0.02	0.12	0.06	0.10	0.08	0.09	0.08
2.00	1.99	2.00	2.00	2.00	2.00	2.00
0.77	0.77	0.00	0.75	0.74	0.78	0.73
0.14	0.11	0.00	0.19	0.18	0.13	0.15

				TS 75838 (Gibson, 1991)			
R13 AMP2	R13 AMP3	R13 AMP4		R6 AMPI1	R6 AMP2	R7 AMP1	R7 AMP2
48.737	48.535	50.059		48.204	47.986	47.92	48.005
1.309	1.27	1.151		1.38	1.433	1.1	1.532
7.427	7.164	6.761		7.302	7.129	7.165	7.443
15.717	14.964	14.857		15.925	16.207	17.402	14.987
0.349	0.27	0.21		0.308	0.231	0.253	0.26
13.186	13.551	14.047		13.376	13.533	12.595	13.795
10.999	10.95	10.889		11.221	11.182	11.447	11.526
1.322	1.281	1.192		1.269	1.31	1.147	1.437
0.625	0.491	0.524		0.594	0.592	0.627	0.685
0.284	0.292	0.259		0.318	0.308	0.315	0.27
0.164	0.179	0.189		0.22	0.164	0.077	0.171
6.92	6.94	7.04		6.86	6.83	6.87	6.84
1.08	1.06	0.96		1.14	1.17	1.13	1.16
0.00	0.00	0.00		0.00	0.00	0.00	0.00
8.00	8.00	8.00		8.00	8.00	8.00	8.00
0.16	0.15	0.16		0.08	0.02	0.08	0.09
0.82	0.83	0.85		0.88	0.97	0.87	0.70
0.14	0.14	0.12		0.15	0.15	0.12	0.16
2.79	2.89	2.94		2.84	2.87	2.69	2.93
1.05	0.96	0.89		1.01	0.96	1.21	1.08
0.04	0.03	0.03		0.04	0.03	0.03	0.03
0.00	0.00	0.00		0.00	0.00	0.00	0.00
5.00	5.00	5.00		5.00	5.00	5.00	5.00
0.00	0.00	0.00		0.00	0.00	0.00	0.00
0.00	0.00	0.00		0.00	0.00	0.00	0.00
1.67	1.68	1.64		1.71	1.70	1.76	1.76
0.33	0.32	0.33		0.29	0.30	0.24	0.24
2.00	2.00	1.97		2.00	2.00	2.00	2.00
0.00	0.00	0.00		0.00	0.00	0.00	0.00
0.04	0.03	0.00		0.06	0.07	0.08	0.16
0.11	0.09	0.09		0.11	0.11	0.11	0.12
0.15	0.12	0.09		0.17	0.17	0.19	0.28
0.07	0.07	0.06		0.08	0.07	0.08	0.07
0.07	0.08	0.08		0.10	0.07	0.03	0.08
2.00	2.00	1.97		2.00	2.00	2.00	2.00
0.73	0.75	0.77		0.74	0.75	0.69	0.73
0.15	0.12	0.09		0.17	0.17	0.19	0.28

							TS 624182 (Al
R16 AMPI1	R16 AMPI2	R18 AMPI1	R18 AMPI2	R24 AMPI1	R24 AMPI2/END		R1 HORN2
51.675	55.291	49.722	50.817	46.376	45.733		46.353
0.346	0.013	0.981	0.947	1.725	1.851		1.292
3.426	2.576	5.743	5.34	8.978	8.886		7
9.713	16.001	16.498	15.285	17.207	17.893		14.667
0.211	0.253	0.364	0.387	0.323	0.414		0.241
15.05	13.025	13.449	14.04	11.829	11.576		13.666
19.317	12.185	11.513	11.468	10.998	11.013		11.341
0.229	0.519	0.957	0.928	1.51	1.441		1.212
0.001	0.11	0.467	0.458	0.692	0.8		0.512
0.023	0.006	0.236	0.21	0.323	0.363		0.264
0	0	0.211	0.289	0.194	0.193		•
7.75	7.87	7.07	7.19	6.66	6.59		6.82
0.25	0.13	0.93	0.81	1.34	1.41		1.18
0.00	0.00	0.00	0.00	0.00	0.00		0.00
8.00	8.00	8.00	8.00	8.00	8.00		8.00
0.35	0.30	0.04	0.08	0.18	0.10		0.03
(2.45)	(0.05)	0.82	0.71	0.86	0.95		0.86
0.04	0.00	0.10	0.10	0.19	0.20		0.14
3.36	2.76	2.85	2.96	2.53	2.49		2.99
3.67	1.96	1.14	1.10	1.20	1.21		0.95
0.03	0.03	0.04	0.05	0.04	0.05		0.03
0.00	0.00	0.00	0.00	0.00	0.00		0.00
5.00	5.00	5.00	5.00	5.00	5.00		5.00
0.00	0.00	0.00	0.00	0.00	0.00		0.00
0.00	0.00	0.00	0.00	0.00	0.00		0.00
2.00	1.86	1.75	1.74	1.69	1.70		1.79
0.00	0.14	0.25	0.25	0.31	0.30		0.21
2.00	2.00	2.00	1.99	2.00	2.00		2.00
1.10	0.00	0.00	0.00	0.00	0.00		0.00
0.07	0.00	0.02	0.00	0.11	0.10		0.13
0.00	0.02	0.08	0.08	0.13	0.15		0.10
1.17	0.02	0.10	0.08	0.24	0.25		0.23
0.01	0.00	0.06	0.05	0.08	0.09		0.07
0.00	0.00	0.09	0.13	0.09	0.09		0.00
2.00	2.00	2.00	1.99	2.00	2.00		2.00
0.48	0.59	0.71	0.73	0.68	0.67		0.76
0.07	0.02	0.10	0.08	0.24	0.25		0.23

berfoyle collection Burnie)		
R1 HORN3	R6 AMPH1	
45.557	46.238	
1.267	1.027	
6.771	6.551	
15.266	14.846	
0.296	0.38	
13.556	13.531	
11.112	11.156	
1.168	1.169	
0.484	0.466	
0.252	0.26	
•	•	
6.75	6.86	
1.18	1.14	
0.06	0.00	
8.00	8.00	
0.00	0.00	
1.01	0.94	
0.14	0.11	
2.99	2.99	
0.82	0.90	
0.04	0.05	
0.00	0.00	
5.00	5.00	
0.00	0.00	
0.00	0.00	
1.76	1.77	
0.24	0.23	
2.00	2.00	
0.00	0.00	
0.10	0.11	
0.09	0.09	
0.19	0.20	
0.06	0.07	
0.00	0.00	
2.00	2.00	
0.79	0.77	
0.19	0.20	

Magnetite									
Magnetite analysed from lavas/shallow intrusives of the feldspar-hornblende andesite/dacite association of the Anthony Road Andesite									
	TS 624182 (Aberfoyle collection Burnie)								
sample	624182R2 MAG1	R2 MAG2	R3 MAG1	R3 MAG2	R10 MAG1	R10 MAG2	R14 MAG 1	R14 MAG2	R18 MAG1COF
(wt%)									
MgO	0.04	0.18	0	0.16	0	0.29	0.02	0.15	0.02
Al2O3	1.14	0.44	0.56	1.05	1.06	0.91	0.87	0.49	2.06
TiO2	5.26	6.31	4.1	6.03	5.28	4.07	3.78	3.11	5.84
V2O5	0.77	0.82	0.49	0.72	0.84	0.63	0.46	0.39	1.03
Cr2O3	0.31	0.36	0.29	0.32	0.35	0.28	0.35	0.24	0.35
MnO	0.11	0.06	0.08	0.07	0.03	0.11	0.07	0.02	0
FeO	35.138	35.456	32.626	32.268	34.387	31.513	32.837	31.231	35.721
ZnO	0.21	0.05	0.17	0.05	0.47	0	0.57	0.02	0.15
Fe2O3	55.07	52.746	55.046	45.908	53.551	52.909	57.103	56.295	51.941
Total	97.91	96.27	93.27	86.45	95.82	90.6	95.98	91.88	96.93
(cations)									
Al	0.419	0.164	0.214	0.435	0.397	0.359	0.327	0.193	0.757
Fe3	12.887	12.57	13.583	12.127	12.813	13.37	13.679	14.101	12.202
Fe2	9.138	9.39	8.947	9.472	9.144	8.85	8.741	8.693	9.326
Mg	0.016	0.083	0	0.084	0	0.147	0.011	0.073	0.01
Ti	1.23	1.502	1.011	1.591	1.263	1.029	0.906	0.779	1.371
Mn	0.028	0.017	0.023	0.021	0.009	0.032	0.02	0.007	0
V	0.159	0.172	0.106	0.168	0.176	0.14	0.096	0.085	0.213
Cr	0.076	0.09	0.075	0.088	0.089	0.073	0.087	0.062	0.087
Zn	0.048	0.011	0.041	0.014	0.11	0	0.133	0.006	0.035
mg#	0.177	0.877	0	0.876	0	1.63	0.125	0.838	0.105
FeO & Fe2O3 calculated stoichiometrically based on 32[O] and 24 cations.									
mg# = Mg/(Mg + Fe2)									

	TS624446 (Aberfoyle collection Burnie)								
R18 MAG2RIM	624446 R1 MA	R1 MAG2	R3 MAG1	R3 MAG2RIM	R4 MAG1CORE	R4 MAG2RIM	R6 MAG1 COR	R6 MAG2 RIM	
0	0.04	0.01	0	0	0.01	0.06	1.98	0.02	
0.48	0.04	0.02	2.74	0.22	0.61	0.19	4.75	0.38	
8.41	6.77	6.82	7.74	6.55	7.67	6	7.22	3.95	
0.71	0.91	0.85	1.14	0.67	1.1	0.75	0.92	0.6	
0.35	0.29	0.28	0.31	0.27	0.19	0.21	0.28	0.23	
0	0.05	0.05	0.09	0.05	0	0.06	0.05	0.05	
33.526	36.316	36.149	37.577	35.219	36.708	35.279	33.034	33.377	
0	0.04	0.01	0.1	0.01	0.03	0.02	0.06	0.1	
39.16	52.865	52.174	47.363	51.042	48.911	53.696	44.083	57.423	
82.52	97.17	96.23	96.87	93.91	95.04	96.14	92.22	96.02	
0.208	0.014	0.009	1.004	0.084	0.23	0.072	1.776	0.142	
10.856	12.521	12.48	11.07	12.499	11.793	12.85	10.518	13.78	
10.328	9.558	9.609	9.76	9.585	9.836	9.382	8.759	8.901	
0.003	0.019	0.006	0	0.002	0.005	0.031	0.935	0.01	
2.331	1.602	1.63	1.808	1.602	1.847	1.434	1.721	0.947	
0	0.014	0.012	0.025	0.013	0	0.016	0.013	0.013	
0.172	0.189	0.179	0.233	0.143	0.233	0.158	0.193	0.126	
0.102	0.073	0.071	0.077	0.069	0.049	0.053	0.071	0.058	
0	0.01	0.003	0.022	0.003	0.007	0.004	0.014	0.024	
0.027	0.196	0.064	0	0.02	0.053	0.327	9.644	0.107	

Apatite											
Apatites analysed from the feldspar-hornblende andesite/dacite (n=6) and pyroxene-feldspar (n=1)											
associations of the Anthony Road Andesite											
									131855		
	624182(Aberfoyle collection Burnie)			624446(Aberfoyle collection Burnie)					BL4 198.80		
Association	Feldspar-hornbende andesite/dacite								Pyroxene-feldspar basaltic andesite		
sample	FdHblR12 APA1	R12 APA2		R8 APATITE1	R8 APATITE2	R10 APATITE1 CORE	R10 APATITE2 RIM		PxFdR9 APT 1		
(wt%)											
F	4.38	4.675		4.239	4.399	4.999	4.767		4.124		
MgO	0.058	•		0.031	0.052	•	•		•		
SiO2	0.329	0.086		0.317	0.316	0.142	0.092		0.102		
SrO	0.064	0.035		0.057	0.076	0.058	0.051		0.091		
P2O5	43.208	43.32		43.464	43.323	43.402	43.244		41.487		
Cl	0.122	0.101		0.1	0.338	0.067	0.043		0.084		
CaO	53.585	53.686		53.304	53.141	53.271	53.136		55.671		
BaO	0.016	0.022		•	0.019	0.001	0.044		0.014		
FeO	0.11	0.066		0.156	0.264	0.18	0.64		0.183		
Total	101.872	101.991		101.668	101.928	102.12	102.017		101.756		

Cr-Spinels									
Cr-spinel microprobe analyses from lavas of the pyroxene-feldspar basaltic andesite association of the Anthony Road Andesite									
Unit	Basaltic andesite BL4 198.80m				Basaltic andesite BL4 199.55m				
Dept. Cat. No.	131855				131856				
Sample	R5 CHROM1	R11 SPI1	R11 SP2	R11 SP3	R1 SP1	R1 SP2	R4 SPI1	R4 SPI2	R5 SPI1
(Wt%)									
MgO	6.41	8.36	10.21	10.44	6.33	6.08	8.03	6.24	10
Al2O3	10.27	10.69	10.47	12.4	9.74	9.69	11.99	12.23	13.01
SiO2	0.04	0.08	0.06	0.04	0.08	0.1	0.12	1.82	0.14
TiO2	0.31	0.28	0.26	0.41	0.21	0.24	0.32	0.32	0.31
Cr2O3	52.77	50.48	53.79	49.72	54.68	54.35	46.74	43.49	48.17
MnO	0.4	0.41	0.43	0.37	0.53	0.44	0.37	1.04	0.23
FeO	23.468	20.421	17.546	17.692	23.439	24.098	20.748	24.603	17.983
NiO	0.11	0.17	0.12	0.12	0.06	0.04	0.1	0.18	0.14
ZnO	0.02	0.01	0.04	0.01	0.05	0.06	0.06	0.2	0.04
Fe2O3	5.738	8.453	6.485	8.294	4.639	5.039	9.294	6.701	7.549
Total	99.53	99.35	99.4	99.51	99.77	100.14	97.77	96.82	97.56
(Cations)									
Si	0.01	0.022	0.015	0.012	0.023	0.028	0.033	0.503	0.037
Al	3.301	3.39	3.278	3.842	3.129	3.111	3.844	3.979	4.099
Fe3	1.177	1.712	1.296	1.641	0.952	1.033	1.903	1.392	1.519
Fe2	5.351	4.595	3.896	3.889	5.344	5.488	4.722	5.679	4.022
Mg	2.603	3.352	4.043	4.093	2.574	2.467	3.257	2.567	3.986
Ti	0.063	0.057	0.052	0.081	0.043	0.05	0.065	0.067	0.062
Mn	0.091	0.093	0.096	0.083	0.123	0.102	0.086	0.242	0.053
Cr	11.376	10.739	11.292	10.333	11.787	11.702	10.056	9.491	10.185
Ni	0.024	0.037	0.025	0.025	0.014	0.008	0.021	0.041	0.029
Zn	0.003	0.002	0.007	0.003	0.011	0.012	0.012	0.04	0.008
100Mg#	32.73	42.18	50.93	51.28	32.51	31.01	40.82	31.13	49.78
100Cr#	77.51	76.01	77.5	72.9	79.02	79	72.35	70.46	71.3
FeO & Fe2O3 calculated stoichiometrically based on 32[O] and 24 cations.									
Mg# = Mg/(Mg + Fe2)									
Cr# = Cr/(Cr + Al)									

Chlorites								
Chlorites analysed from within the feldspar-hornblende andesite/dacite association of the Anthony Road Andesite								
	TS75838 (Gibson, 1991)							
Sample	R2 CHL1	R2 CHL2	R10 CHL1	R10 CHL2	17 CHL1	R17 chl2	R19 CHL1	R19 CHL2
SiO2	25.86	30.4	24.69	24.67	24.54	24.86	25.58	27.65
TiO2	0.01	0.01	0	0.03	0.03	0.02	0.04	0
Al2O3	17.07	17.1	18.41	18.3	18.73	17.8	18.55	17.18
Cr2O3	0.01	0	0.04	0	0	0.03	0.09	0
FeO*	27.09	25.58	27.86	28.13	27.15	26.73	27.45	26.46
MnO	0.5	0.41	0.47	0.43	0.42	0.41	0.46	0.4
MgO	14.95	12.33	13.65	13.9	14.11	14.61	14.27	14.05
CaO	0.08	0.06	0.06	0.04	0.01	0.02	0.16	1.3
TOTAL	85.56	85.89	85.19	85.5	84.99	84.46	86.61	87.05
	Number of ions on the basis of 28 oxygens							
Si	5.685	6.486	5.483	5.465	5.439	5.536	5.555	5.934
Aliv	2.315	1.514	2.517	2.535	2.561	2.464	2.445	2.066
Alvi	2.108	2.786	2.301	2.243	2.331	2.207	2.303	2.278
Ti	0.001	0.002	0	0.005	0.005	0.003	0.006	0
Cr	0.003	0	0.008	0	0	0.005	0.016	0
Fe2+	4.98	4.564	5.173	5.212	5.033	4.978	4.987	4.749
Mg	4.898	3.923	4.519	4.592	4.661	4.849	4.622	4.494
Mn	0.093	0.074	0.088	0.081	0.078	0.077	0.085	0.073
Ca	0.018	0.013	0.015	0.008	0.002	0.005	0.038	0.3
Mg/Mg+Fe	0.5	0.46	0.47	0.47	0.48	0.49	0.48	0.49
Fe/Fe+Mg	0.5	0.54	0.53	0.53	0.52	0.51	0.52	0.51

TS 624182 (Aberfoyle collection Burnie)					
R7 CHLO1	R7 CHLO2	R17 CHLOR1	R17 CHLOR2	R5 CHLOR2	
27.85	27.14	26.34	28.24	29.37	
0.16	1.46	0.06	0.04	0.08	
16.61	17.4	17.4	16.48	19.83	
0.02	0	0	0	0.06	
21.8	20.73	21.69	21.63	22.25	
0.45	0.55	0.51	0.57	0.17	
18.6	16.93	16.82	18.36	13.78	
0.09	1.44	0.77	0.07	0.18	
85.58	85.64	83.6	85.38	85.72	
5.917	5.765	5.762	6.004	6.162	
2.083	2.235	2.238	1.996	1.838	
2.078	2.121	2.248	2.133	3.065	
0.026	0.233	0.01	0.006	0.012	
0.003	0	0	0	0.009	
3.873	3.683	3.968	3.846	3.903	
5.893	5.362	5.483	5.821	4.309	
0.08	0.098	0.095	0.102	0.031	
0.021	0.327	0.181	0.016	0.04	
0.6	0.59	0.58	0.6	0.52	
0.4	0.41	0.42	0.4	0.48	

APPENDIX E

WHOLEROCK GEOCHEMICAL DATA

1. **Sample descriptions and sample localities**

2. **Results**
   - **Analytical methods**
   - **Major & trace elements**
   - **Rare earth elements** — **Ion exchange XRF**; **ICPMS (Analabs)**

(Sample powders housed within the Geology Department rock store, University of Tasmania)

1. Sample descriptions

40-3/94	Feldspar-hornblende-phyric andesite (magnetic) Hornblende phenocrysts to 7mm; Feldspar to 3mm Sericite-chlorite-epidote alteration of groundmass
41-3/94	Feldspar-hornblende-quartz-phyric andesite (magnetic) Phenocrysts (hornblende to 9mm; feldspar to 2mm; quartz to 1mm) Minor sericite-albite-silica alteration
42-3/94	Feldspar-hornblende-phyric andesite (magnetic) Feldspar phenocrysts to 3mm; Hornblende to 3mm Hornblendes strongly sericite altered Groundmass sericite-silica-albite±chlorite altered
44-3/94	Feldspar-hornblende-phyric andesite (magnetic) Strong sericite alteration + hematite-albite
45-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 5mm; Feldspar to 2mm Sericite-albite-silica±epidote alteration
46-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 7mm; Feldspar to 4.5mm Groundmass pervasive sericite with silica, minor epidote±pyrite altered
47-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 6.5mm; Feldspar to 3.5mm Strong sericite-silica-chlorite alteration, minor epidote-pyrite
48-3/94	Feldspar-hornblende-quartz-phyric andesite (non-magnetic) Hornblende phenocrysts to 5mm; Feldspar to 2mm Sericite-silica-epidote altered
49-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 7mm; Feldspar 3mm Sericite-epidote-silica altered
52-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 5mm; Feldspar to 2.5mm Hornblende fresh to sericite-pyrite altered; Feldspars sericite±epidote altered Groundmass sericite-epidote-pyrite altered
53-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 8mm; Feldspar to 3mm Groundmass sericite-silica, minor pyrite altered
54-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 4mm; Feldspar to 3mm Sericite-epidote-silica alteration
55-3/94	Feldspar-hornblende±pyroxene-phyric andesite (non-magnetic) Feldspar phenocrysts to 3mm; Hornblende to 6mm Porphyritic

	Sericite-silica altered with epidote-chlorite
56-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 7mm; Feldspar to 3mm Strong sericite-silica alteration
59-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Feldspar phenocrysts to 2mm; Hornblende to 5mm Groundmass strong sericite-chlorite altered
60-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Feldspar phenocrysts to 3mm; Hornblende to 4mm Feldspar sericite altered; Hornblende sericite±chlorite altered Groundmass strong sericite-epidote alteration
61-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Hornblende phenocrysts to 5mm; Feldspar to 3mm Feldspars with minor sericite/epidote alteration; Hornblende sericite altered
cores	
	Groundmass is sericite/silica altered
62-3/94	Feldspar-hornblende-phyric andesite (non-magnetic) Phenocrysts of hornblende to 4mm; Feldspars altered away Strong sericite-silica alteration
63-3/94	Feldspar-hornblende-phyric andesite (magnetic) Hornblende phenocrysts to 10mm; Feldspar to 2mm Groundmass sericite-silica altered, minor pyrite
64-3/94	Feldspar-hornblende-phyric andesite (magnetic) Feldspar phenocrysts to 3mm; Hornblende to 5mm Groundmass strongly albite-silica-sericite altered
89a-3/94	Banded dark red ironstone (magnetic)
20-4/94	Feldspar-quartz-phyric flowbanded rhyolite (magnetic) Quartz phenocrysts to 3.5mm; Flowbands grey and orange Fresh
70-4/94	Feldspar-quartz-phyric rhyolitic porphyry (non-magnetic) Quartz phenocrysts to 3mm; feldspar to 3mm; Flowbanded Minor albite/sericite/chlorite/hematite alteration
71-4/94	Feldspar-quartz±mafic phyric rhyolitic porphyry (not magnetic) Quartz phenocrysts to 3mm; Flowbanded (pink/orange and green bands) Chlorite-albite-sericite minor alteration
73-4/94	Feldspar-quartz rhyolitic porphyry (magnetic) Quartz phenocrysts to 3mm; Flowbanded (orange and green bands) Chlorite and albite alteration
74-4/94	Feldspar±hornblende andesite (magnetic) Groundmass strong sericite, minor chlorite, silica alteration
76-4/94	Feldspar-quartz-phyric rhyolitic porphyry (magnetic) Quartz phenocrysts to 4mm; Feldspar to 2mm Quartz fresh; Some feldspars altered Groundmass sericite-silica-chlorite±minor magnetite altered

80-4/94	Feldspar-quartz±mafic phyric rhyolitic porphyry (slightly magnetic) Quartz phenocrysts to 5mm Sericite-albite-chlorite groundmass alteration
82-4/94	Massive dark red ironstone (non-magnetic)
18-5/94	Feldspar-hornblende?-quartz-phyric andesite/dacite (magnetic) Phenocrysts (feldspar to 4mm; hornblende 2-3mm; quartz to 1mm) Sericite-epidote-albite-silica altered
20-5/94	Hornblende-feldspar-FeTi oxide±quartz-phyric andesite (magnetic) Hornblende phenocrysts to 4mm with minor sericite alteration Groundmass albite altered
38-5/95	Feldspar-phyric coherent dacite (From Newton Dam Spillway eastern wall) Non-magnetic; Feldspar phenocrysts to 3mm Groundmass sericite altered with minor silica
40-5/94	Feldspar-phyric dacite (clast from Newton Dam Spillway; non-magnetic) Feldspar phenocrysts to 2mm Groundmass sericite-silica altered
41-5/94	Quartz-feldspar-phyric rhyolite (non-magnetic) Quartz phenocrysts to 2.5mm; Feldspar to 3mm Groundmass is pink from albite-silica alteration
BL4 198.8m	Feldspar-pyroxene-phyric basaltic andesite Calcite filled vesicules
BL4 199.55m	Feldspar-pyroxene-phyric basaltic andesite Vesicules are calcite filled

Geochemical sample localities				
Dept. Cat. No.	**Field no.**	**Coordinates**	**Lithostratigraphic Unit**	**Facies**
131790	21-3/94	379130E, 5353160N	Anthony Road Andesite	Fd-hbl andesite
131791	32-3/94	379290E, 5352820N	Anthony Road Andesite	Fd-hbl andesite
131792	35-3/94	379390E, 5352850N	Anthony Road Andesite	Fd-hbl andesite
131793	40-3/94	380610E, 5355840N	Anthony Road Andesite	Fd-hbl andesite
131794	41-3/94	380600E, 5355810N	Anthony Road Andesite	Fd-hbl andesite
131795	42-3/94	380615E, 5355790N	Anthony Road Andesite	Fd-hbl andesite
131796	44-3/94	380585E, 5355790N	Anthony Road Andesite	Fd-hbl andesite
131797	45-3/94	380330E, 5355350N	Anthony Road Andesite	Fd-hbl andesite
131798	46-3/94	380315E, 5355340N	Anthony Road Andesite	Fd-hbl andesite
131799	47-3/94	380300E, 5355320N	Anthony Road Andesite	Fd-hbl andesite
131800	48-3/94	380270E, 5355300N	Anthony Road Andesite	Fd-hbl andesite
131801	52-3/94	380155E, 5355250N	Anthony Road Andesite	Fd-hbl andesite
131802	53-3/94	380115E, 5355255N	Anthony Road Andesite	Fd-hbl andesite
131803	54-3/94	380050E, 5355210N	Anthony Road Andesite	Fd-hbl andesite
131804	55-3/94	379905E, 5355255N	Anthony Road Andesite	Fd-hbl andesite
131805	56-3/94	380050E, 5355235N	Anthony Road Andesite	Fd-hbl andesite
131806	59-3/94	379755E, 5355120N	Anthony Road Andesite	Fd-hbl andesite
131807	60-3/94	379735E, 5355075N	Anthony Road Andesite	Fd-hbl andesite
131808	61-3/94	379675E, 5355035N	Anthony Road Andesite	Fd-hbl andesite
131809	62-3/94	379590E, 5354870N	Anthony Road Andesite	Fd-hbl andesite
131810	63-3/94	379570E, 5354855N	Anthony Road Andesite	Fd-hbl andesite
131811	64-3/94	379570E, 5354840N	Anthony Road Andesite	Fd-hbl andesite
131814	89a-3/94	380665E, 5358520N	Lake Newton Ironstone	Ironstone
131816	20-4/94	381230E, 5358860N	Tyndall Group	Qtz-fd rhyolite
131817	70-4/94	380390E, 5358425N	Anthony Road Andesite	Fd-qtz rhyolite
131818	71-4/94	380395E, 5358420N	Anthony Road Andesite	Fd-qtz rhyolite
131819	73-4/94	380400E, 5358420N	Anthony Road Andesite	Fd-qtz rhyolite
131820	74-4/94	380600E, 5358400N	Anthony Road Andesite	Fd-qtz rhyolite
131821	76-4/94	380610E, 5358400N	Anthony Road Andesite	Fd-qtz rhyolite

131822	80-4/94	380315E, 5358370N	Anthony Road Andesite	Fd-qtz rhyolite
131823	82-4/94	380610E, 5358425N	Lake Newton Ironstone	Ironstone
131824	18-5/94	379830E, 5358540N	Anthony Road Andesite	Fd-hbl andesite
131825	20-5/94	379945E, 5358515N	Anthony Road Andesite	Fd-hbl andesite
131826	38-5/94	380015E, 5358342N	Central Volcanic Complex	Dacite near spillway
131827	40-5/94	379990E, 5358345N	Newton Dam Spillway package	fd dacite lithic
131828	41-5/94	380650E, 5359300N	Tyndall Group	Qtz-fd rhyolite
131829	1-11/94	378850E, 5354153N	Yolande River Sequence	Feldspar sandstone
131830	2-11/94	378860E, 5354160N	Yolande River Sequence	Feldspar sandstone
131831	5-11/94	380660E, 5356120N	Tyndall Group	Fd-qtz sandstone
131832	6-11/94	380800E, 5356660N	Tyndall Group	Fd-qtz sandstone
131833	7-11/94	381048E, 5357290N	Tyndall Group	Welded ignimbrite lithic
131834	8-11/94	381065E, 5357340N	Tyndall Group	Fd-qtz sandstone
131835	9-11/94	381075E, 5357630N	Tyndall Group	Fd-qtz sandstone
131836	11-11/94	381240E, 5358855N	Tyndall Group	Qtz-fd rhyolite
131837	12-11/94	380580E, 5359540N	Tyndall Group	Qtz-fd rhyolite
131838	14-11/94	380165E, 5360160N	Tyndall Group	Qtz-fd rhyolite
131839	16-11/94	379875E, 5358280N	Anthony Road Andesite	Fd-hbl andesite
131840	25-11/94	378050E, 5352380N	intrudes Yolande River Sequence	col. join. rhyolite/dacite
131841	11-1/95	379305E, 5354695N	Yolande River Sequence	Feldspar sandstone (Alt.)
131842	24-1/95	381045E, 5357290N	Tyndall Group	f.g. siltstone (pyrite alt)
131843	25-1/95	381195E, 5358985N	Tyndall Group	Qtz-fd rhyolite
131844	27-1/95	381250E, 5359100N	Tyndall Group	Qtz-fd rhyolite
131845	32-1/95	379840E, 5352370N	Anthony Road Andesite	mafic sandstone
131846	Crown Hill Andesite	379460E, 5346300N	Crown Hill Andesite	Fd-hbl andesite
131847	Owen Coherent	381796E, 5359690N	intrudes Owen Conglomerate	Fd-qtz rhyolitic dyke
131848	BL1 91.35m	380970E, 5352625N	Anthony Road Andesite	Fd-hbl andesite/dacite
131849	BL1 225.50m	380970E, 5352625N	Anthony Road Andesite	Fd-hbl andesite
131850	BL1 357.30m	380970E, 5352625N	Anthony Road Andesite	Qtz-fd rhyolite
131851	BL2 145.0m	380875E, 5353405N	Anthony Road Andesite	Fd±hbl andesite/dacite
131852	BL3 90.40m	380985E, 5353990N	Anthony Road Andesite	Fd-hbl andesite
131853	BL3 329.70	380985E, 5353990N	Anthony Road Andesite	Fd-hbl andesite
131854	BL4 188.70	380750E, 5353825N	Anthony Road Andesite	Fd-px-basaltic andesite
131855	BL4 198.8	380750E, 5353825N	Anthony Road Andesite	Fd-px-basaltic andesite

131856	BL4 199.55	380750E, 5353825N	Anthony Road Andesite	Fd-px-basaltic andesite
131857	BL4 265.60	380750E, 5353825N	Anthony Road Andesite	Fd-hbl andesite
131858	BL5 25.90m	380541E, 5353651N	Anthony Road Andesite	Fd-hbl andesite
131859	BL5 86.75m	380541E, 5353651N	Anthony Road Andesite	Fd-px basaltic andesite
131860	BL5 184.25m	380541E, 5353651N	Anthony Road Andesite	Fd-px basaltic andesite
131861	BL5 207.80m	380541E, 5353651N	Anthony Road Andesite	Px-fd basaltic andesite
131862	BL5 342.0m	380541E, 5353651N	Anthony Road Andesite	Qtz-fd rhyolite
131863	BLD89-1 234.70m	380416E, 5352715N	Anthony Road Andesite	Fd-hbl andesite
131864	BLD89-2 117.10	380985E, 5352615N	Anthony Road Andesite	Fd-hbl andesite
131865	BLD89-2 244.40	380985E, 5352615N	Anthony Road Andesite	Fd-hbl andesite
131866	BLD89-3 98.30m	381140E, 5352760N	Anthony Road Andesite	Qtz-fd rhyolite
131867	BLD89-3 260.50m	381140E, 5352760N	intrudes Tyndall Group	Basaltic dyke
131868	BLD89-3 294.60m	381140E, 5352760N	intrudes Tyndall Group	Basaltic dyke
131869	BLD89-3 324.10	381140E, 5352760N	intrudes Tyndall Group	Basaltic dyke??
131871	HA3 229.0m	380986.991E, 5358154.820N	Anthony Road Andesite	Fd-hbl andesite
131872	HA7 174.15m	380617E, 5358501N	Anthony Road Andesite	Qtz-fd rhyolite
131873	HA8 18.30	380620E, 5358630N	Anthony Road Andesite	Fd-hbl andesite
131874	TYN1 221.80m	380958E, 5355660N	Anthony Road Andesite	Hbl-fd andesite
131875	TYN3 233.17m	380570E, 5356630N	Anthony Road Andesite	Hbl-fd andesite
131876	TYN3 350.21	380570E, 5356630N	Anthony Road Andesite	Fd-hbl andesite
131877	TYN4 73.15m	381113.600E, 5356190.300N	Anthony Road Andesite	Fd-hbl andesite
131878	TYN4 226.0m	381113.600E, 5356190.300N	Anthony Road Andesite	Fd-hbl andesite
131879	TYN5 5.0m	381083.100E, 5356587.700N	Anthony Road Andesite	Fd-hbl andesite
131880	TYN5 306.0m	381083.100E, 5356587.700N	Anthony Road Andesite	Hbl andesite
131881	LEECH HILL 297.80m	379365.500E, 5353632.700N	Anthony Road Andesite	Fd-hbl/px andesite
131882	LEECH HILL 168.75m	379365.500E, 5353632.700N	Anthony Road Andesite	Fd-hbl andesite
131883	NC1 104.90m	381212.500E, 5357318.300N	intrudes Tyndall Group	Px basaltic dyke??
131884	NC1 763.55m	381212.500E, 5357318.300N	intrudes Tyndall Group	Px basaltic dyke
131885	NC2 379.85m	381329.300E, 5358110.500N	intrudes Tyndall Group	Px basaltic dyke
131886	NC2 385.85m	381329.300E, 5358110.500N	intrudes Tyndall Group	Px basaltic dyke
131887	AJ88	381511E, 5359494N	intrudes Owen Conglomerate	Px basaltic dyke(in OC)
131930	9-2/95	380590E, 5358420N	Anthony Road Andesite	Qtz-fd rhyolite
131931	10-2/95	380600E, 5358440N	Lake Newton Ironstone	Ironstone
131932	11-2/95	380600E, 5358420N	Lake Newton Ironstone	Ironstone

131933	12-2/95	380610E, 5358400N	Lake Newton Ironstone	Ironstone
131934	13-2/95	380630E, 5358380N	Lake Newton Ironstone	Ironstone
131935	14-2/95	380600E, 5358370N	Anthony Road Andesite	Fd-hbl andesite
131936	15-2/95	380625E, 5358360N	Lake Newton Ironstone	Ironstone
131937	16-2/95	380635E, 5358350N	Lake Newton Ironstone	Ironstone
131938	17-2/95	380660E, 5358400N	Anthony Road Andesite	Fd-hbl andesite
131939	18-2/95	380650E, 5358445N	Lake Newton Ironstone	Ironstone

2. Results

Analytical methods

Analytical Methods

All sample preparation was conducted using facilities in the Geology Department at the University of Tasmania. Samples were trimmed of weathered material and then crushed to an ~5 mm fraction in a steel jaw crusher. Sample size was varied (100 g to 400 g) depending on phenocryst sizes and proportion of phenocrysts present. The ~5 mm fraction was subsequently ground to powder in a tungsten-carbide ring mill. Use of the tungsten-carbide ring mill has resulted in W, Co and Ta contamination.

Most samples were analysed at the University of Tasmania. Nineteen samples were analysed by Analabs for the REE using inductively-coupled plasma mass spectrometry (ICP-MS).

Major element abundances of samples analysed at the University of Tasmania were determined on fusion discs (altered silicate preparation; 3.7125 g Norrish Flux, 0.77 g sample powder, 1 ml of 38.5% $LiNO_3$ solution) following the methods of Norrish and Hutton (1969). Trace element abundances were determined on pressed powder pellets (6 g sample powder, boric acid backing) following the methods of Norrish and Chappell (1977). Loss on ignition (LOI) analyses, the percentage loss in weight after heating, were undertaken to determine the volatile content of each sample. This involved heating 1-2 g of sample powder at 1000°C for 8 to 10 hours. Six samples were analysed for the REE at the University of Tasmania using the ion-exchange X-ray fluorescence spectrometry (XRF) procedure of Robinson et al. (1986). Sample preparation for ion-exchange was carried out by Ms Nilar Hlaing. All analyses (major, trace and REE) were determined by XRF spectrometry on a fully automated Philips 1410 spectrometer in the Geology Department at the University of Tasmania. In-house standards (Tasbas, Tasmonz, Tasgran) have been analysed concurrently to monitor the precision of analyses. Mr Phil Robinson was the analyst responsible for XRF operation throughout these analyses.

Seventeen samples and two University of Tasmania internal standards included to check analytical precision and accuracy were analysed by Analabs for the suite of REE using ICP-MS at their Western Australian laboratory. Samples were crushed at the University of Tasmania. At Analabs 0.2 g of sample powder was dissolved in a mixed aqua regia/perchloric/hydrofluoric acid digest.

2. Results

Major & trace elements

Major and trace element geochemical results										
	Anthony Road Andesite						Anthony Road Andesite				
	Pyroxene-feldspar basaltic andesite association						Feldspar-hornblende andesite/dacite association				
Dept. Cat. No.	131855	131856	131859	131861	131860	131854	131793	131794	131795	131796	131797
Sample No.	BL4(198.8)	BL4(199.55)	BL5/86.75	BL5/207.8	BL5/184.25	BL4 188.7	40-3/94	41-3/94	42-3/94	44-3/94	45-3/94
Major oxides (wt%)											
SiO2	54.99	55.16	52.42	51.64	55.38	52.12	66.03	61.65	58.64	60.04	59.15
TiO2	0.50	0.52	0.59	0.54	0.54	0.59	0.40	0.52	0.56	0.53	0.49
Al2O3	14.13	14.13	15.62	15.19	14.34	15.56	16.31	15.56	16.36	16.85	15.11
FeO*	8.32	8.20	9.72	9.70	8.08	10.16	4.13	6.56	7.93	7.32	8.07
MnO	0.12	0.12	0.16	0.15	0.13	0.15	0.06	0.13	0.14	0.13	0.12
MgO	7.66	7.53	8.68	7.19	6.92	7.97	1.81	3.99	4.64	4.13	5.31
CaO	8.60	8.54	7.46	10.02	9.58	7.88	2.47	2.77	2.87	2.71	4.95
Na2O	3.26	3.55	3.31	4.15	2.49	2.89	8.03	5.31	5.15	7.13	4.78
K2O	1.68	1.52	1.41	0.79	1.95	1.71	0.55	3.14	3.36	0.87	1.66
P2O5	0.57	0.56	0.65	0.63	0.59	0.69	0.16	0.21	0.22	0.20	0.24
BaO	0.19	0.15	0.13	0.12	0.23	0.28	0.04	0.15	0.14	0.07	0.13
LOI	3.37	3.17	3.63	5.23	3.59	4.34	0.98	1.53	2.27	2.35	1.95
TOTAL	100	100	100	100	100	100	100	100	100	100	100
Trace elements (ppm)											
Y	26	26	30	30	28	30	19	23	24	23	23
Rb	30	27	35	16	47	31	12	74	76	21	57
Ni	135	132	150	145	136	148	9	15	16	18	39
Nb	8	8	10	8	8	10	6	8	9	9	7
Zr	162	164	180	175	173	185	126	173	177	169	141
Sr	615	568	716	940	956	917	361	258	250	364	485
Ba	1,516	1,277	1,197	1,030	2,007	2,448	278	1,320	1,267	461	1,074
Sc	27	30	33	29	30	31	21	26	26	27	28
V	229	223	257	240	219	262	177	171	188	176	221
Cr	549	538	619	579	578	643	39	40	39	49	139
Ti/Zr	18.66	19.14	19.65	18.46	18.68	19.23	18.88	18.18	18.95	18.82	20.74
P2O5/TiO2	1.12	1.08	1.10	1.18	1.10	1.16	0.41	0.39	0.40	0.38	0.50
AI	44.03	42.82	48.37	36.02	42.35	47.30	18.35	46.89	49.94	33.68	41.75
AI=100(MgO+K2O)/(MgO+K2O+Na2O+CaO)											
FeO*=FeO+Fe2O3											

131798	131799	131800	131801	131802	131803	131804	131805	131806	131807	131808	131809	131810
46-3/94	47-3/94	48-3/94	52-3/94	53-3/94	54-3/94	55-3/94	56-3/94	59-3/94	60-3/94	61-3/94	62-3/94	63-3/94
57.13	58.79	59.40	57.18	60.08	56.50	65.58	64.46	62.43	60.44	59.06	60.84	57.48
0.51	0.45	0.44	0.48	0.47	0.48	0.42	0.39	0.40	0.45	0.44	0.45	0.47
15.83	16.29	16.00	16.38	15.64	16.19	14.71	13.82	14.22	14.80	15.49	14.88	16.26
7.76	6.67	6.44	8.14	7.28	9.16	6.28	6.54	7.05	7.49	8.05	7.19	8.01
0.16	0.10	0.10	0.11	0.10	0.16	0.10	0.09	0.11	0.11	0.11	0.13	0.15
5.60	4.18	3.95	4.87	6.18	5.53	3.48	3.75	4.02	4.39	4.96	4.49	5.62
5.54	6.21	6.99	7.80	3.84	6.26	2.69	5.50	6.96	7.63	7.11	6.76	6.57
5.42	6.67	5.75	3.14	4.22	3.11	2.75	2.70	2.58	2.99	3.29	2.18	3.73
1.53	0.30	0.58	1.57	1.91	2.24	3.56	2.44	1.90	1.40	1.18	2.73	1.39
0.32	0.31	0.28	0.24	0.21	0.23	0.23	0.19	0.20	0.22	0.22	0.22	0.23
0.20	0.03	0.06	0.10	0.09	0.13	0.21	0.11	0.11	0.09	0.09	0.15	0.10
2.37	1.78	1.40	2.40	2.75	2.62	2.68	1.70	3.67	2.02	2.25	4.41	4.80
100	100	100	100	100	100	100	100	100	100	100	100	100
25	21	23	22	22	22	19	19	20	21	25	22	22
54	10	23	54	60	72	132	108	88	56	47	68	35
45	36	35	42	41	40	29	36	38	36	35	40	45
9	7	7	7	8	7	7	5	6	6	7	7	6
166	147	150	143	139	147	141	113	124	127	135	129	137
444	504	648	673	279	530	298	435	460	709	622	543	796
1,750	124	359	750	702	983	1,884	884	924	755	766	1,103	755
29	26	26	29	28	27	24	24	25	26	28	30	27
211	209	209	230	197	239	168	187	180	194	205	204	203
154	144	127	102	101	107	144	114	95	101	107	156	171
18.51	18.27	17.75	20.15	20.35	19.57	17.84	20.85	19.47	21.24	19.61	20.85	20.46
0.63	0.68	0.64	0.49	0.43	0.49	0.54	0.49	0.49	0.50	0.49	0.49	0.49
39.39	25.81	26.18	37.06	50.10	45.32	56.39	43.00	38.28	35.29	37.14	44.67	40.52

131811	131824	131825	131839	131845	131871	131858	131874	131848	131852	131851	131875	131879
64-3/94	18-5/94	20-5/94	16-11/94	32-1/95	HA3/229.9	BL5/25.9	TYN1/221.8	BL1/91.35	BL3/90.4	BL2/145	TYN3/233.17	TYN5/5
63.32	65.07	64.97	64.28	69.26	57.92	61.63	61.18	64.10	51.67	60.92	58.72	55.92
0.43	0.43	0.41	0.41	0.52	0.69	0.42	0.49	0.40	0.55	0.49	0.50	0.57
14.26	16.45	15.68	15.38	15.42	18.99	16.27	15.61	16.60	18.30	17.11	15.68	17.08
7.34	6.58	6.06	5.94	5.28	7.04	7.09	7.26	7.43	9.33	8.07	7.61	8.99
0.11	0.06	0.10	0.07	0.04	0.07	0.13	0.12	0.13	0.12	0.22	0.09	0.13
3.59	2.82	3.16	3.25	1.55	2.55	4.10	3.90	4.48	5.64	5.44	4.04	5.50
5.31	0.50	1.94	2.58	1.68	3.94	2.67	3.40	0.79	9.12	2.27	5.76	4.69
2.32	5.84	4.13	4.57	2.03	8.00	6.43	5.37	4.38	3.00	4.18	5.32	5.77
2.98	1.93	3.02	3.15	3.98	0.52	1.06	2.46	1.49	1.93	0.99	1.92	0.92
0.21	0.21	0.20	0.20	0.16	0.27	0.20	0.20	0.21	0.33	0.31	0.36	0.42
0.14	0.12	0.34	0.17	0.09	0.02	0.08	0.16	0.19	0.07	0.06	0.19	0.04
3.64	2.44	2.10	1.62	3.84	2.77	2.12	1.81	3.38	4.18	3.70	3.24	2.67
100	100	100	100	100	100	100	100	100	100	100	100	100
23	15	18	19	33	22	20	22	18	22	24	24	28
73	34	58	62	126	12	26	53	41	65	35	32	27
34	23	20	20	8	15	25	16	28	51	29	32	33
7	7	8	7	12	10	6	7	7	9	9	7	11
127	145	141	137	235	185	144	171	148	173	157	172	178
557	211	607	480	80	589	316	403	392	983	517	499	507
1,106	1,134	3,071	1,470	784	185	721	1,400	1,599	732	553	1,657	310
28	21	21	22	13	23	23	23	21	34	21	25	28
201	170	169	168	73	201	188	172	166	245	204	209	230
124	54	52	56	18	47	69	43	65	191	106	78	69
20.12	17.80	17.34	17.84	13.32	22.42	17.44	17.18	16.06	19.06	18.68	17.37	19.28
0.49	0.48	0.50	0.50	0.30	0.39	0.49	0.42	0.53	0.60	0.64	0.73	0.73
46.27	42.79	50.46	47.25	59.84	20.44	36.20	42.04	53.56	38.45	49.92	34.98	38.01

131849	131880	131881	131878	131863	131877	131882	131876	131853	131857	131864	131865
BL1/225.5	TYN5/306.0	LHILL/297.8	TYN4/226.0	BLD89-1/234.7	TYN4/73.15	LHILL/168.75	TYN3 350.21	BL3 329.70	BL4 265.60	BLD89-2 117.10	BLD89-2 244.40
58.65	60.26	62.21	57.07	61.91	53.36	66.86	58.88	63.62	62.02	60.96	60.95
0.47	0.49	0.39	0.47	0.47	0.60	0.52	0.50	0.42	0.37	0.42	0.43
15.22	13.48	15.48	17.38	14.98	16.85	15.71	14.84	14.77	14.66	17.67	16.45
7.90	7.79	6.72	8.57	7.39	9.42	5.57	7.94	6.14	6.36	6.99	6.39
0.16	0.17	0.10	0.13	0.12	0.16	0.11	0.19	0.12	0.09	0.05	0.08
5.26	5.16	3.15	4.96	4.74	7.05	2.34	4.12	3.57	3.35	3.11	3.68
6.64	5.07	6.83	3.49	5.58	5.68	3.41	5.31	4.09	7.23	3.39	7.26
4.49	4.40	1.39	6.41	3.77	5.59	0.77	4.87	6.75	3.72	4.39	3.64
0.94	2.87	3.54	1.23	0.82	0.86	4.55	2.81	0.29	1.89	2.53	0.75
0.27	0.32	0.19	0.29	0.27	0.44	0.16	0.35	0.22	0.20	0.23	0.22
0.08	0.22	0.15	0.09	0.06	0.06	0.17	0.20	0.02	0.10	0.27	0.17
2.74	1.87	9.46	2.31	4.62	4.72	6.88	2.84	1.76	3.78	2.89	3.70
100	100	100	100	100	100	100	100	100	100	100	100
22	22	20	24	22	27	37	24	20	18	17	22
27	49	120	38	16	27	126	73	6	73	60	25
32	41	24	33	38	32	9	33	24	23	29	25
7	8	6	9	8	11	12	8	6	7	8	8
133	176	136	157	160	176	232	155	138	132	145	147
674	365	149	389	917	582	75	521	496	754	750	708
720	1,961	1,252	764	584	607	1,441	1,706	154	917	2,334	1,361
29	35	23	23	23	27	14	28	24	18	21	26
227	215	177	194	174	203	80	208	172	159	178	191
82	218	59	110	122	53	16	81	64	59	75	81
21.29	16.80	17.06	17.90	17.61	20.44	13.39	19.49	18.24	16.99	17.45	17.34
0.57	0.65	0.49	0.61	0.57	0.73	0.31	0.69	0.51	0.53	0.54	0.51
35.78	45.86	44.85	38.48	37.29	41.24	62.28	40.53	26.27	32.35	42.06	28.89

				Anthony Road Andesite Quartz-feldspar rhyolite association							
131873	131790	131791	131792	131817	131818	131819	131820	131821	131822	131850	131862
HA8 18.30	21-3/94	32-3/94	35-3/94	70-4/94	71-4/94	73-4/94	74-4/94	76-4/94	80-4/94	BL1/357.3	BL5/342.0
56.15	63.88	62.43	60.68	75.66	72.01	66.92	63.78	57.01	69.17	70.05	61.52
0.72	0.42	0.41	0.47	0.27	0.31	0.37	0.63	0.80	0.32	0.32	0.43
20.60	15.42	15.25	15.87	13.55	15.20	16.46	18.54	22.46	15.29	15.50	16.55
10.74	6.32	6.70	7.45	1.76	2.57	5.69	7.16	7.38	5.35	4.84	6.44
0.23	0.07	0.11	0.13	0.03	0.04	0.10	0.17	0.11	0.09	0.04	0.19
1.80	3.38	3.81	4.40	0.51	0.75	1.68	1.32	1.11	1.76	1.41	2.88
1.86	4.89	3.81	4.51	0.20	0.27	0.30	1.19	3.04	0.21	1.81	6.61
3.69	2.90	3.66	3.45	4.94	5.39	4.68	4.88	5.02	4.50	3.16	3.87
3.91	2.43	3.33	2.63	2.73	3.05	3.42	2.06	2.68	2.92	2.71	1.26
0.19	0.19	0.20	0.21	0.14	0.17	0.19	0.16	0.20	0.14	0.16	0.25
0.11	0.10	0.29	0.18	0.22	0.23	0.21	0.11	0.19	0.24	0.10	0.10
2.58	2.35	2.25	2.61	1.07	1.27	2.20	2.39	2.66	2.09	3.65	4.82
100	100	100	100	100	100	100	100	100	100	100	100
31	23	19	21	18	18	17	47	29	14	17	23
151	75	95	75	55	63	80	74	98	69	84	40
9	23	23	28	5	6	10	10	9	6	9	21
10	7	7	6	8	9	10	8	10	9	8	8
186	142	128	123	131	147	167	137	174	140	139	141
403	516	590	572	249	275	310	425	633	273	184	919
988	926	2,458	1,472	2,012	2,153	2,032	784	1,666	2,240	855	816
22	21	21	27	12	13	15	21	24	12	12	21
305	163	166	198	66	86	122	228	261	101	112	182
5	61	56	72	9	12	18	<2	6	8	8	66
23.30	17.72	19.23	23.11	12.55	12.80	13.17	27.46	27.69	13.54	13.98	18.28
0.26	0.46	0.48	0.43	0.52	0.55	0.53	0.25	0.24	0.45	0.48	0.59
50.73	42.70	48.84	46.87	38.67	40.15	50.66	35.77	32.00	49.84	45.34	28.34

			Lake newton Ironstone			Tyndall Group						
			Ironstone	Ironstone		Qtz-fd rhyolite	Qtz-fd rhyolite	Qtz-fd rhyolite	Qtz-fd rhyolite	Qtz-fd rhyolite	Qtz-fd rhyolite	Qtz-fd rhyolite
131866	131872		131814	131823		131816	131828	131843	131844	131836	131837	131838
BLD89-3/98.3	HA7/174.15		89a-3/94	82-4/94		20-4/94	41-5/94	25-1/95	27-1/95	11-11/94	12-11/94	14-11/94
69.10	71.02		83.12	85.58		75.35	79.02	80.04	78.89	76.48	77.10	80.55
0.34	0.36		0.01	0.01		0.15	0.16	0.13	0.18	0.14	0.20	0.19
15.38	16.10		0.23	0.29		13.29	11.36	10.74	11.52	12.24	12.86	11.20
4.29	3.67		16.50	13.91		1.16	1.22	1.76	2.12	1.88	1.01	0.20
0.05	0.20		0.01	0.01		0.02	0.00	0.01	0.01	0.02	0.00	0.00
0.91	0.86		0.02	0.01		0.23	0.22	0.29	0.40	0.29	0.28	0.09
3.38	1.61		0.03	0.14		0.21	0.03	0.03	0.03	0.14	0.02	0.04
3.31	0.68		0.00	0.00		3.55	2.96	4.56	4.49	3.41	4.43	4.12
3.07	5.34		0.05	0.02		5.81	4.80	2.33	2.24	5.21	3.95	3.49
0.17	0.17		0.02	0.02		0.03	0.03	0.02	0.02	0.02	0.02	0.02
0.16	0.19		0.02	0.03		0.18	0.20	0.09	0.10	0.16	0.13	0.10
4.39	4.79		0.27	0.19		0.58	0.63	0.55	0.76	0.63	0.57	0.41
100	100	100	100	100		100	100	100	100	100	100	100
16	20		5	4		62	36	45	39	53	42	33
97	149		2	1		124	99	39	38	111	76	61
8	4		5	3		2	1	1	2	1	1	1
8	9		5	2		21	14	18	17	20	16	14
149	145		36	24		183	174	151	190	172	216	206
320	57		6	30		110	64	82	82	100	74	55
1,401	1,594		43	52		1,475	1,865	760	938	1,350	1,194	863
13	13		2	4		6	8	3	5	4	7	4
114	95		95	269		3	4	4	7	4	3	2
8	6		<2	2		<2	<2	1	1	<1	1	1
13.88	14.87		1.68	2.53		4.97	5.58	5.20	5.72	4.94	5.58	5.56
0.48	0.47		2.00	2.00		0.20	0.19	0.15	0.11	0.14	0.10	0.11
37.32	73.07		70.00	17.65		61.65	62.71	36.31	36.85	60.78	48.78	46.29

Tyndall Group		Tyndall Group						CVC		NDam Spillway		Yolande River Sequence	
Welded Ignimbrite		Qtz-fd sandstone	Qtz-fd sandstone	Qtz-fd sandstone	Qtz-fd sandstone	Qtz-fd sandstone		Fd dacite		Fd dacite lithic		Fd sandstone	Fd sandstone
131833		131842	131831	131832	131834	131835		131826		131827		131829	131830
7-11/94		24-1/95	5-11/94	6-11/94	8-11/94	9-11/94		38-5/94		40-5/94		1-11/94	2-11/94
76.12		87.10	68.51	80.39	65.80	69.06		71.43		69.42		65.09	71.28
0.22		0.32	0.36	0.12	0.59	0.46		0.49		0.46		1.03	0.54
12.58		7.37	16.50	11.20	16.66	15.77		14.43		14.90		20.56	14.37
2.10		0.93	4.66	2.15	5.28	3.29		5.34		7.11		5.27	4.23
0.03		0.01	0.05	0.03	0.13	0.06		0.06		0.08		0.03	0.08
0.73		0.84	2.35	0.71	1.79	1.24		0.87		1.37		1.14	1.05
0.32		0.21	0.65	0.09	0.73	0.98		1.54		0.91		0.24	3.34
4.58		1.81	4.33	3.92	7.34	7.11		3.12		3.71		1.02	0.42
3.13		1.32	2.29	1.33	1.44	1.77		2.48		1.82		5.26	4.38
0.03		0.05	0.12	0.01	0.11	0.18		0.14		0.14		0.21	0.18
0.16		0.03	0.18	0.06	0.12	0.08		0.08		0.06		0.13	0.12
0.69		1.44	2.32	1.65	1.68	0.90		2.91		2.50		3.79	4.87
100		100	100	100	100	100	100	100		100		100	100
38		13	30	19	21	27		35		36		32	45
68		59	83	39	21	27		93		73		190	162
2		4	14	1	2	3		3		4		5	3
14		6	8	16	7	10		11		10		10	12
243		99	152	106	150	290		221		222		188	272
274		67	460	159	314	257		162		203		38	148
1,436		314	1,601	533	1,116	734		724		495		1,207	1,035
9		9	10	4	15	14		15		10		18	13
5		143	60	11	90	55		56		43		105	35
1		72	22	2	10	8		4		3		7	6
5.48		19.62	14.15	6.94	23.75	9.45		13.40		12.53		32.76	11.89
0.14		0.16	0.34	0.08	0.19	0.40		0.29		0.31		0.20	0.33
44.06		51.57	48.24	33.67	28.65	27.08		41.85		40.90		83.60	59.03

		Yolande River Sequence		Crown Hill Andesite		Tyndall Group						
Fd sandstone(alt)		Col. join. rhyolite		Fd-hbl andesite		Basaltic dyke	Basaltic dyke	Basaltic dyke	Basaltic dyke	Basaltic dyke	Basaltic dyke	Basaltic dyke
131841		131840		131846		131869	131886	131884	131885	131883	131868	131867
11-1/95		25-11/94		CROWN HILL		BLD89-3 324.10	NC2/385.85	NC1/763.55	NC2/379.85	NC1/104.9	BLD89-3/294.6	BLD89-3/260.5
70.38		70.86		57.80		52.63	47.48	54.32	49.27	45.85	60.05	56.42
0.51		0.38		0.51		0.75	1.69	1.05	1.82	1.88	0.62	0.84
14.82		14.45		15.39		18.25	18.82	19.31	18.36	18.74	15.74	19.52
5.62		4.91		7.75		10.30	9.66	10.43	11.15	13.08	7.88	10.45
0.53		0.07		0.11		0.18	0.20	0.21	0.16	0.52	0.16	0.09
0.82		0.91		5.42		5.68	7.70	2.55	7.03	7.62	3.44	2.43
0.31		0.48		8.24		6.12	10.28	5.09	6.85	7.78	4.83	1.44
2.91		4.09		2.81		2.95	2.63	5.44	2.59	2.57	5.57	7.75
3.83		3.64		1.55		2.79	1.27	1.31	2.49	1.69	1.53	0.82
0.14		0.08		0.36		0.27	0.25	0.28	0.28	0.28	0.17	0.24
0.13		0.12		0.07		0.09	0.05	0.03	0.12	0.05	0.14	0.05
2.70		1.65		2.14		7.83	6.39	6.26	7.62	7.91	5.77	2.89
100	100	100		100	100	100	100	100	100	100	100	100
59		36		23		24	33	29	38	42	26	39
106		101		66		106	59	49	111	76	26	27
3		2		39		67	78	19	78	78	33	9
10		11		7		7	8	6	8	8	7	9
217		241		173		144	164	129	198	189	145	177
95		103		716		212	346	179	294	280	315	440
1,237		1,102		618		726	397	272	989	434	1,139	421
13		11		23		41	44	37	41	40	38	30
57		21		193		306	235	350	252	257	240	237
3		2		128		109	313	12	191	196	76	2
14.00		9.40		17.61		31.16	61.73	48.68	55.09	59.71	25.66	28.44
0.29		0.22		0.70		0.36	0.15	0.27	0.15	0.15	0.28	0.28
59.08		49.89		38.66		48.30	41.00	26.87	50.20	47.33	32.36	26.08

	Owen Conglomerate		Owen Conglomerate		
	Basaltic dyke		Rhyolitic dyke		
	131887		131847		
	AJ88		OWEN COHERENT		
	49.11		78.11		
	1.63		0.17		
	17.28		13.26		
	10.30		4.08		
	0.17		0.01		
	7.43		1.06		
	10.46		0.16		
	3.03		0.01		
	0.33		3.09		
	0.26		0.04		
	0.02		0.01		
	8.27		3.96		
	100		100		
	33		44		
	8		164		
	78		3		
	6		19		
	165		209		
	301		28		
	124		99		
	34		4		
	218		2		
	170		1		
	59.34		4.79		
	0.16		0.25		
	36.49		96.14		

Major and trace elements (cont.)						
Samples analysed by ANALABS						
	Lake Margaret Ironstone (Chapter 8)					
	Ironstone					
DEPT. CAT. NO.	131931	131932	131933	131934	131936	131937
SAMPLE NO.	AJ 10-2/95	AJ 11-2/95	AJ 12-2/95	AJ 13-2/95	AJ 15-2/95	AJ 16-2/95
(wt%)						
SiO2	89.20	67.10	75.40	87.80	87.90	85.70
TiO2	0.01	0.04	0.05	0.02	0.04	0.05
Al2O3	0.27	0.66	1.13	0.35	0.75	0.97
FeO*	9.93	31.91	22.39	11.23	10.35	11.99
MnO	0.01	0.01	0.03	0.01	0.03	0.03
MgO	0.04	0.12	0.19	0.05	0.11	0.13
CaO	0.07	0.08	0.03	0.02	0.11	0.16
Na2O	0.05	0.05	0.14	0.06	0.10	0.15
K2O	0.03	0.10	0.19	0.08	0.11	0.13
P2O5	0.01	0.02	0.01	0.01	0.03	0.02
L.O.I.	0.13	0.36	0.41	0.40	0.33	0.36
Trace Elements (ppm)						
V	65	129	129	82	50	129
Co	<5	<5	6	<5	<5	<5
Cr	<5	<5	<5	6	9	<5
Ni	<5	<5	<5	<5	<5	<5
Cu	5	4	<4	<4	33	9
Zn	10	18	26	11	25	26
Pb	<5	<5	<5	<5	184	59
Rb	5	9	10	<5	11	6
Sr	21	25	22	9	39	55
Y	6	8	5	3	8	7
Zr	16	15	32	13	22	39
Nb	<3	3	<3	<3	<3	<3
Ba	77	111	135	79	82	77
Au	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Ag	<2	<2	<2	<2	<2	<2
As	10	30	25	21	42	34
Bi	<20	<20	<20	<20	<20	<20
Cd	<2	<2	<2	<2	<2	<2
Sb	14	40	23	27	25	43
Hg	0	0	0	0	0	0

				Altered Rhyolite		Altered fd-hbl andesite	
131939	131823	131814		131930		131935	131938
AJ 18-2/95	82-4/94	89a-4/94		AJ 9-2/95		AJ 14-2/95	AJ 17-2/95
79.20	84.55	82.39		55.80		63.50	57.80
0.07	0.01	0.01		0.77		0.54	0.64
2.66	0.29	0.23		21.40		15.80	21.70
16.11	13.74	16.35		7.76		7.63	5.78
0.03	0.01	0.01		0.12		0.21	0.07
0.50	0.01	0.02		1.07		1.39	1.51
0.04	0.14	0.03		3.12		2.25	0.51
0.80	bd	bd		4.24		3.16	5.68
0.11	0.02	0.05		2.66		2.60	2.76
0.03	0.02	0.02		0.18		0.30	0.25
0.65	0.19	0.27		2.77		2.05	2.99
235	269	95		232		223	233
<5	nd	nd		15		37	10
<5	2	<2		7		19	80
<5	3	5		<5		15	10
<4	nd	nd		8		68	<4
54	nd	nd		142		193	171
<5	nd	nd		7		43	<5
8	1	2		100		103	122
43	30	6		710		568	407
5	4	5		27		28	21
30	24	36		171		157	189
<3	2	5		8		9	9
63	52	43		1603		1059	1041
<0.008	nd	nd		<0.008		<0.008	<0.008
<2	nd	nd		<2		<2	<2
15	nd	nd		10		132	6
<20	nd	nd		<20		<20	<20
<2	nd	nd		<2		<2	<2
16	nd	nd		14		30	6
0	nd	nd		0		0	0

MO5 program SCMO TUBE			1 DEC 1995 [illegible]		
Ident	Th				
35-3/94	20				
21-3/94	26				
63-3/94	26				
12/11/94	23				
BL4/188.7	28				
80-4/94	28				
AJ88-6/95	2				
32-3/94	22				
20-5/94	25				
BL4/198.8	24				
11/11/94	24				
NC1/104.9	2				
TYN3/233.17	28				
NC2/399.85	1				
70-4/94	25				
27-1/95	20				
BL1/91-35	29				
16-11/94	25				
BL4/199.55	26				
18-5/94	26				
BLD89-2/244.4	26				
BL1/357.3	30				
TYN1/221.8	20				
HA7/174.15	31				
TYN4/73.15	29				
41-5/94	21				
61-3/94	25				
TYN4/226.0	32				
73-4/94	34				
BLD89-2/117.1	28				
TYN5/306	22				
NC2/385.85	2				
BL1/225.5	24				
BL3/90.4	28				
48-3/94	23				
BL5/342.0	28				
LHill/297.8	23				
40-3/94	15				
20-4/94	25				
BL5/86.75	27				
HA3/224.9	25				
BLD89-1/234.7	26				
TYN5/5.0	30				
BL5/184.25	26				
14-11/94	18				
71-4/94	30				
BL5/207.8	26				
BLD89-3/98.3	29				
25-1/95	20				
Precision:-					
TASGRAN1(7)	18.7				
TASGRAN1/7	18.6				
TASGRAN1(7)	19.2				

Samples from this study analysed by R. Berry (1995)

1/12/95

Andrew Jones samples			RONREE		TAS XRF P.R.
LACEND program GOLD TUBE					24/11/95
Ident	La	Ce	Nd		
80-4/94	50	93	28		
AJ88	13	30	18		
BL4-188.7	114	234	102		
12/11/94	47	98	40		
21-3/94	73	132	49		
35-3/94	57	104	41		
63-3/94	54	106	41		
BL1/91-35	45	86	29		
70-4/94	78	144	46		
TYN3/233.17	75	142	54		
NC1/104.9	17	35	22		
11/11/94	71	145	66		
BL4/198.8	107	207	91		
32-3/94	55	105	34		
20-5/94	51	102	33		
BLD89-2	67	124	41		
TYN1/221.8	51	97	37		
BL1/357.3	70	123	40		
NC2/379.85	13	34	19		
BL4/199.55	105	210	89		
27-1/95	37	75	36		
18-5/94	44	78	33		
Triplicate(same pill)					
16-11/94	60	114	39		
16-11/94	60	112	40		
16-11/94	60	109	38		
BLD87-1/234.7	68	127	48		
NC2/385.85	11	32	18		
BL5/86.75	109	221	98		
TYN4/73.15	88	167	69		
25-1/95	53	103	44		
HA7/174.15	72	126	42		
61-3/94	57	107	44		
48-3/94	58	112	47		
BL5/342.0	59	114	44		
73-4/94	36	64	23		
TYN4/226.0	81	153	60		
41-5/94	56	113	51		
BL5-207.8	107	207	94		
40-3/94	41	84	33		
BL3/90.4	81	152	60		
TYN5/306	74	138	53		
BL1/225.5	61	122	49		
BLD89-3/98.3	71	127	43		
71-4/94	73	132	42		
BL5/184.25	99	206	90		
20-4/94	105	217	105		
LHILL/277.8	58	102	36		
HA3/224.9	44	89	37		
14-11/94	12	29	13		
TYN5/5.0	93	175	76		

Samples analysed by R.Berry (1995)

2. Results

Rare earth elements

- Ion exchange XRF
- ICPMS (Analabs)

Ion Exchange XRF - Rare Earth Elements						
	Anthony Road Andesite					Tyndall Group
	Qtz-fd rhyolite	Px-fd bas and	Fd-hbl and/dac	Fd-hbl and/dac	Fd-hbl and/dac	Qtz-fd rhyolite
Dept. Cat. No.	131818	131856	131800	131810	131793	131828
Sample	71-4/94	BL4 199.5m	48-3/94	63-3/94	40-3/94	41-5/94
La	67.7	106.3	68.1	68.2	43.2	48.7
Ce	121.8	210.9	130.2	125.4	86.6	93.3
Pr	12.69	23.75	14.55	13.46	9.51	12.05
Nd	43.2	93.2	53.9	49.1	35.7	46.3
Sm	6.68	15.15	9.27	8.27	6.34	8.7
Eu	1.72	3.97	2.6	2.12	1.61	1.54
Gd	3.87	9.63	6.14	5.39	4.54	6.82
Dy	3.23	5.61	4.48	4.15	3.58	6.23
Er	2.15	2.73	2.82	2.81	2.46	3.99
Yb	2.13	2.1	2.38	2.44	1.93	3.86
*analysed at the University of Tasmania. (analyst P. Robinson; sample preparation N.Hlaing)						

ICPMS Rare Earth Elements (page 1)								
	Owen Conglomerate		Tyndall Gp				CVC	YRS
	Rhyolitic dyke	Mafic Dykes		??	Qtz-fd rhyolites, Tyndall Group		Dacite, CVC	Fd sandstone
Dept. Cat. No.	131847	131887	131885	131869	131838	131836	131826	131841
Sample	OWENCOHERENT	AJ88	NC2 379.85	BLD89-3 324.10	14-11/94	11-11/94	38-5/94	11-1/95
La	61.5	11.4	13.2	42.4	13.4	72.5	39.3	46.4
Ce	126	27.5	31.7	85	28.9	144	78.9	97.5
Pr	14.4	3.67	4.2	10.1	3.55	16.9	8.8	11.4
Nd	48.4	16.1	18.2	35.5	13.5	59.6	32	40.9
Sm	9.7	4.5	4.9	8.1	3.5	13	7.6	9.5
Eu	1.18	1.53	1.75	1.63	0.66	1.69	1.6	2.1
Gd	7.8	4.9	5.4	5.2	3.8	9.6	5.6	8.7
Dy	6.5	4.7	5.2	3.8	4.4	7.7	5	7.7
Er	3.8	2.9	2.9	2.1	3.1	4.5	3.3	4.5
Yb	3.7	2.4	2.5	1.8	3.2	4.2	3.3	3.9

ICPMS Rare Earth Elements (page 2)								
	Anthony Road Andesite							
	Q-fd rhyolite, ARA			Px-Fd basand, /	Fd-hbl andesite/dacite, ARA			
Dept. Cat. No.	131850	131866	131930	131860	131839	131791	131871	131864
Sample	BL1 357.30	BLD89-3 98.3	9-2/95	BL5 184.25	16-11/94	32-3/94	HA3229.90	BLD89-2 117.10
La	70.2	73.7	30.4	112	61.2	62	45.7	76.5
Ce	125	128	56.2	217	111	108	93.4	134
Pr	12.7	13.1	6.43	25	11.8	11.7	10.4	13.6
Nd	38.7	40.1	22.5	87.8	37.9	37.1	34.4	42.2
Sm	7.2	7.6	4.8	17.6	7.5	7	6.8	7.5
Eu	1.47	1.66	1.54	3.97	1.67	1.78	1.37	1.84
Gd	3.9	4.1	3.6	10.3	4.6	4.5	4.4	4.5
Dy	2.1	2.7	3.4	5.3	3.3	3.1	3.3	3.1
Er	1.1	1.5	2.3	2.3	1.8	1.8	1.9	1.6
Yb	1.2	1.5	2.2	1.7	1.8	1.8	1.8	1.5

131865	131852	131935	131938
BLD89-2 244.40	BL3 90.4	AJ 14-2/95	AJ 17-2/95
74.9	93.4	74.1	20
130	171	141	39.7
13.3	18.5	15.6	4.21
41.9	60.3	56.6	14.2
7.9	12	10.3	3
1.77	2.54	2.79	0.86
4.7	6.6	7.9	2.2
3.2	3.9	5.2	2
1.9	1.9	2.6	1.1
1.9	1.7	2.4	1.2

ICPMS Rare Earth Elements (page 3)							
	Lake Newton Ironstone						
Dept. Cat. No.	131931	131932	131933	131934	131936	131937	131939
Sample	AJ 10-2/95	AJ 11-2/95	AJ 12-2/95	AJ 13-2/95	AJ 15-2/95	AJ 16-2/95	AJ 18-2/95
La	5.25	11.3	9.28	2.19	7.94	10.1	10.1
Ce	8.75	23	16.8	3.28	14.3	16.9	20.3
Pr	0.86	2.35	1.57	0.4	1.56	1.95	1.87
Nd	3	6.7	5	1.4	5.6	7	6.3
Sm	0.6	1.5	1	0.3	1.2	1.2	1.1
Eu	0.14	0.67	0.22	0.09	0.29	0.31	0.29
Gd	0.6	1.5	0.7	0.3	1.2	1.1	0.9
Dy	0.5	1.4	0.8	0.4	1.1	1	0.7
Er	0.4	1.2	0.6	0.4	1.1	0.8	0.5
Yb	0.8	1.5	0.7	0.8	2.3	1.7	0.7

APPENDIX F

X-RAY DIFFRACTION RESULTS

1. **XRD Method**
2. **XRD Sample Descriptions**
3. **XRD Results**

(Sample powders housed within the Geology Department rock store,
University of Tasmania)

1. XRD Method

In total, 28 samples were analysed by X-ray diffraction at Tasmania Development and Resources on a PHILIPS PW1710 X-ray diffractometer run over a 2θ angle range of 4° - 57.4°. All samples were pre-crushed at the Department of Geology, University of Tasmania, and then analysed and interpreted by Richie N. Wooley (Analyst).

2. XRD Sample Descriptions

No.	Sample No.	Formation	Description
1	NC3 731.45m	Tyndall Group ???	Volcanic Sandstone
2	8.-11/94	Tyndall Group	Feldspar-quartz sandstone
3	NC2 465.50m	Tyndall Group	Sandstone
4	HA4 212.9m	Tyndall Group	Sandstone
5	NC3 742.05m	Tyndall Group	Limestone
6	HA6 112.70m	Tyndall Group	Sandy Limestone
7	16.-11/94	Anthony Road Andesite	Feldspar-hornblende andesite
8	21.-3/94	Anthony Road Andesite	Feldspar-hornblende andesite
9	32-3/94	Anthony Road Andesite	Feldspar-hornblende andesite
10	47-3/94	Anthony Road Andesite	Feldspar-hornblende andesite
11	42-3/94	Anthony Road Andesite	Feldspar-hornblende andesite
12	HA2 89m	Anthony Road Andesite	Andesite breccia
13	BL4 268.23m	Anthony Road Andesite	Feldspar-hornblende andesite
14	BL3 210.23m	Anthony Road Andesite	Andesite breccia
15	71-4/94	Anthony Road Andesite	Feldspar-quartz rhyolite
16	82-4/94	Lake Newton Ironstone	Ironstone
17	5.-11/94	Tyndall Group	Feldspar-quartz sandstone
18	1.-11/94	Yolande River Sequence	feldspar sandstone
19	11.-1/94	YRS or ARA ???	feldspathic sandstone
20	BLD89-3 301.5m	Anthony Road Andesite	feldspathic sandstone
21	BLD89-1 61.30m	Anthony Road Andesite	feldspathic sandstone
22	NC3 1016.20m	Owen Conglomerate?	vein
23	NC1 688.75m	Anthony Road Andesite	altered sandstone
24	NC2 480.70m	ARA/Tyndall Group?	altered sandstone
25	BLD89-3 247.2m	Anthony Road Andesite	altered sandstone
26	HA2 179.1m	Anthony Road Andesite	veins
27	HA1 101.50m	Tyndall Group	vein
28	HA2 256.7m	Anthony Road Andesite	vein

3. XRD Results

X-Ray Diffraction results for 28 samples. Results are in approximate wt %. Samples were analysed by R.N.Wooley at Tasmania Development and Resources.

Sample	>60 %	40-60%	25-40 %	15-25 %	10-15 %	5-10 %	<5 %
1-11/94			Quartz, Mica	Chlorite	Plagioclase		
5-11/94		Albite	Quartz		Chlorite	Mica	
8-11/94	Albite			Quartz		Chlorite	Magnetite, Mica, ?Pyrite
16-11/94			Albite, Quartz	Amphibole	Clinopyroxene	Chlorite	Mica, ?Epidote
21-3/94			Quartz	Plagioclase, Amphibole	Clinopyroxene	Chlorite	Mica
32-3/94			Amphibole	Quartz, Plagioclase		Clinopyroxene, Chlorite	Mica, ?Magnetite
42-3/94		Albite			Chlorite, Clinopyroxene	Amphibole, Quartz	Mica
47-3/94		Albite		Amphibole	Clinopyroxene, Chlorite	Quartz, Epidote	?Pyrite
80-4/94			Quartz, Albite		Chlorite	?Clinopyroxene*, Mica	
82-4/94	Quartz			Hematite			
11-1/95		Quartz		Plagioclase, Mica	Chlorite	Clinopyroxene	?Epidote
HA1 101.50m		Albite		Fluorite	Quartz	Mica, Calcite	Chlorite, ?Apatite
HA2 89.00m			Quartz, Albite	Epidote			Calcite, Chlorite, Mica
HA2 179.10m			Quartz, Chlorite		Plagioclase	Calcite, Epidote	Mica
HA2 256.70m			Quartz, Calcite	Chlorite		Mica	Plagioclase
HA4 212.90m			Mica, Calcite		Hematite	Quartz, Chlorite, Plagioclase	
HA6 112.70m	Calcite				Quartz	Chlorite	Mica
NC1 688.75m			Ankerite, Albite	Mica, Kaolinite	Quartz	Chlorite	?Pyrite/Hematite, ?Calcite
NC2 465.50m		Quartz	Mica	Chlorite		Plagioclase	Calcite, Pyrite/Hematite
NC2 480.70m			Chlorite, Mica	Plagioclase	Quartz	Calcite	
NC3 731.45m	Mica					Quartz	Chlorite
NC3 742.05m	Dolomite						Calcite, Quartz, Mica, Plagioclase
NC3 1016.20m	Chlorite		Quartz				Calcite
BL3 210.23m		Quartz	Albite	Clinopyroxene	Amphibole		Chlorite, Mica, ?Hematite
BL4 268.23m			Albite, Amphibole	Quartz	Chlorite	Clinopyroxene	Mica, Calcite
BLD89-1 61.30m		Quartz		Plagioclase, Chlorite, Mica			
BLD89-3 247.20m			Chlorite	Mica, Plagioclase		Quartz, Calcite	Hematite
BLD89-3 301.50m	Quartz			Plagioclase		Mica, Chlorite	Chlorite, Dolomite, Pyrite

APPENDIX G

DIAMOND DRILLHOLE LOCATIONS AND GRAPHIC LOGS OF DRILLHOLES

1. Drillhole locality plan

2. Drillhole co-ordinates

3. Symbols used in graphic logs

4. Diamond drillhole graphic logs

PROGRAM: dhs
PROSPECT: img
PLAN definition:
GRID: AMG
E: 378800.0 382900.0
N: 5352000.0 5360000.0
RL: -1000.0 -1000.0

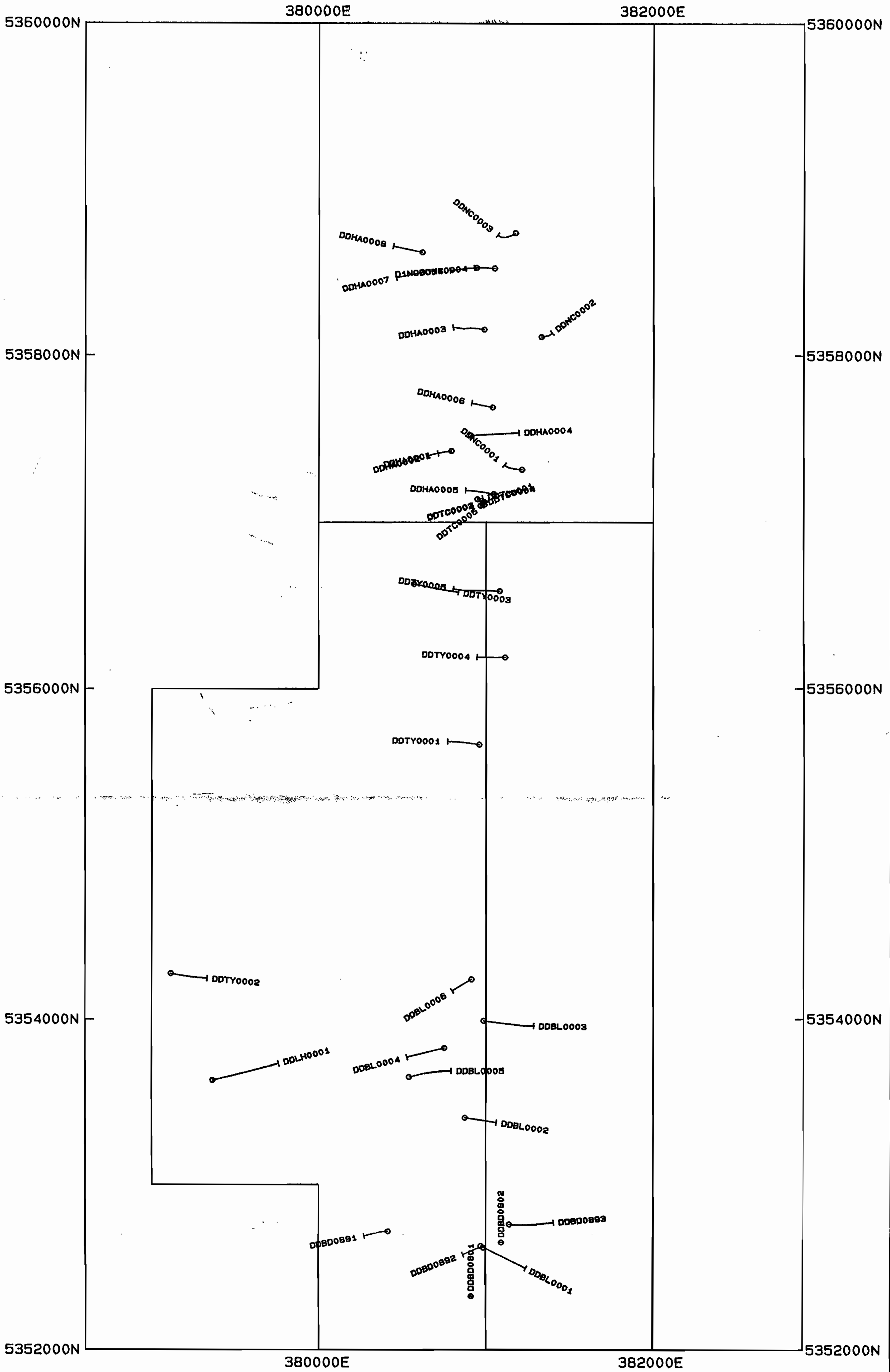
Forward extent : 10000.0
Backward extent: 10000.0

PDF file: ej.pdf
PCF file: ej.pcf
PLOTfile: img005.plt
CRI file: eb-ddh.cri

LEGEND - Right Side

LEGEND - Left Side

* POLYGON/STRINGS *
Criteria Item: 1
Extents size: 10000.00



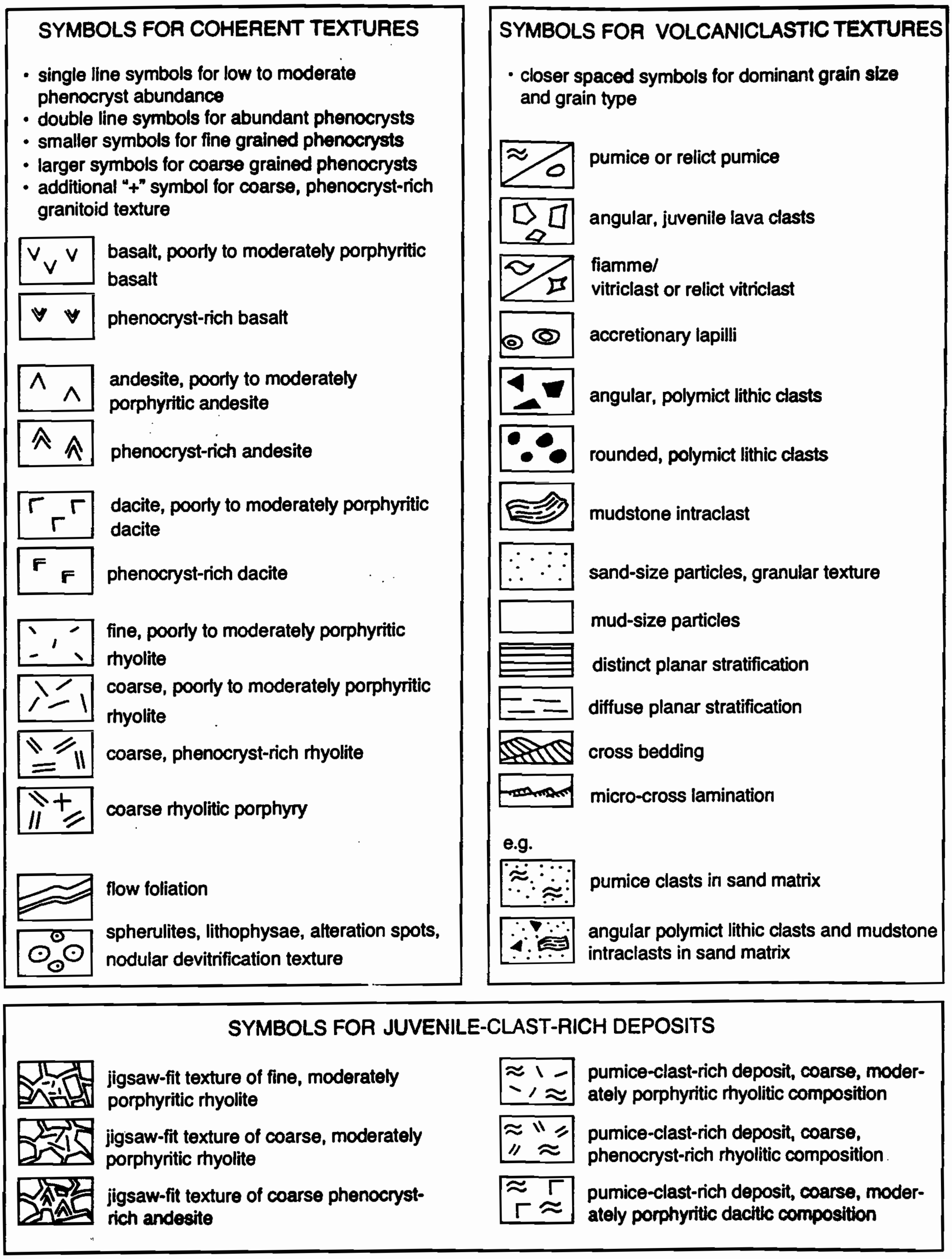
Aberfoyle Resources Limited
EXPLORATION DIVISION

REVISIONS				Tasmania Anthony Basin DRILL HOLE LOCATIONS	Compiled:
Init.	Date	Init.	Date		Drawn:
					Traced:
					Checked:
Location Code:				Scale: 1 : 25000 / Date: 28/09/95	Plate No.:

2. Drillhole co-ordinates

Drillhole	Collar Easting	Collar Northing	RL	Depth
NC1	381212.500	5357318.300	537.50	829.80
NC2	381329.300	5358110.500	536.30	631.00
NC3	381172.300	5358738.500	521.30	1081.00
NC4 (not logged)	381049.340	5358526.340	511.40	577.20
TYN1	380958.000	5355660.000	504.00	223.70
TYN2	379115.000	5354275.000	513.00	269.70
TYN3	380570.000	5356630.000	515.00	365.80
TYN4	381113.600	5356190.300	511.30	250.40
TYN5	381083.100	5356587.700	520.20	372.70
BLD89-1	380416.000	5352715.000	532.00	235.00
BLD89-2	380985.000	5352615.000	621.00	250.00
BLD89-3	381140.000	5352760.000	642.00	388.40
BL1	380970.000	5352625.000	623.00	484.00
BL2	380875.000	5353405.000	549.00	296.00
BL3	380985.000	5353990.000	547.00	451.00
BL4	380750.000	5353825.000	505.00	289.00
BL5	380541.000	5353651.000	503.90	346.50
BL6 (not logged)	380912.400	5354240.100	538.10	
HA1	380791.657	5357429.890	490.00	137.20
HA2	380790.655	5357429.650	490.00	259.10
HA3	380986.991	5358154.820	504.00	243.80
HA4	380907.089	5357523.960	508.00	403.10
HA5	381044.000	5357172.440	509.00	297.50
HA6	381038.031	5357690.200	510.00	250.00
HA7	380617.000	5358501.000	458.30	233.50
HA8	380616.316	5358622.380	476.00	251.50
LEECH HILL	379365.500	5353632.700	525.50	504.00

3. Symbols used in graphic logs



The symbols used for graphic logging throughout this study are those given in McPhie et al. (1993).

4. Diamond drillhole graphic logs

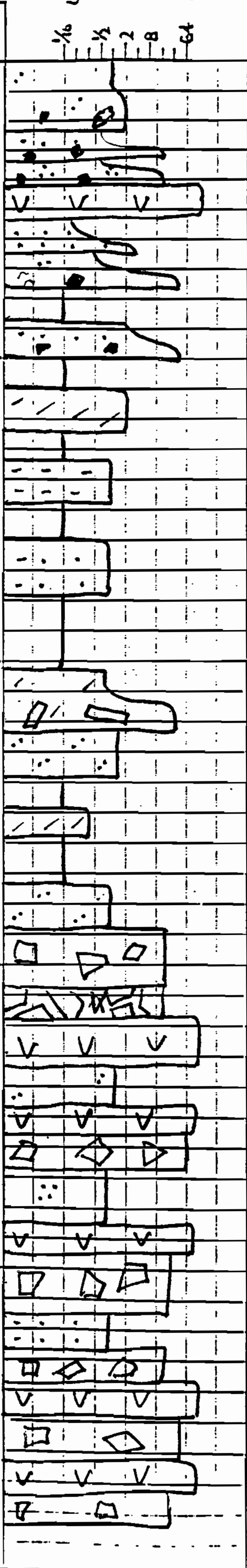
Note

Drillholes from across the study area have been logged at a scale of 1:200 making the inclusion of all logs inappropriate. A one page unscaled summary of each drillhole is presented and full logs for those holes thought critical in providing information on stratigraphic relationships and facies characteristics are included. Full graphic logs for drillholes NC1, TYN2, TYN4, TYN5, BLD89-3, BL1, BL4, BL5, HA1, HA4, HA6, HA7, HA8 and Leech Hill are included in this appendix. Graphic logs of drillholes not included may be made available by the author upon request.

LOG Andrew Jones — Summary of Newton Creek 1

HOLE NC1

date: | grainsize | scale none | page 1 of 1

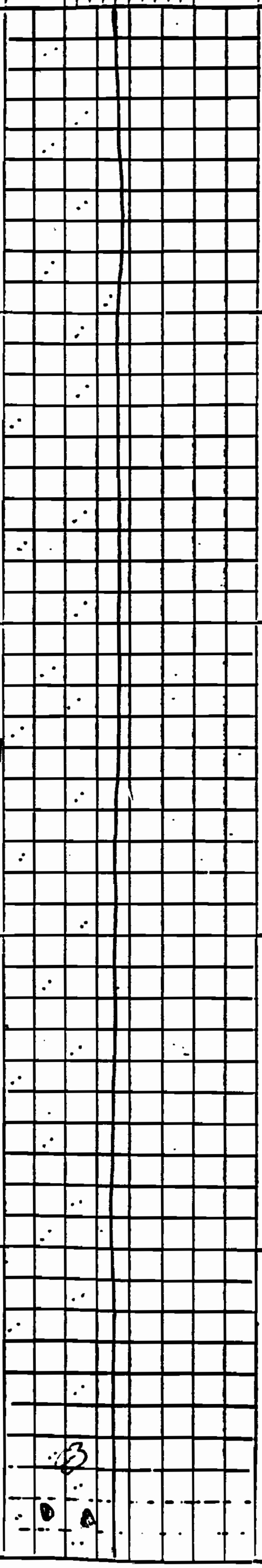


m	alteration	description
	AbSi - Cl	Fd-qtz xal rich sandstone with polymict breccia base (AbSi-Cl bands)
62.7		Graded fd-qtz sandstones with breccia bases
104.7		Feldspar-pyroxene basaltic andesite? (dyke)
105.1		AbSi-Cl banded fd-qtz sandstones/breccias
292.28		white massive carbonate
295.16	ClHm SeCo	c.g. fd-qtz xal sandstones - breccias
306.55	HmCo ClSe	Banded - massive carbonate
307.95		Hm/carbonate altered fd-qtz sandstones
316.95		Banded/massive carbonate
317.38		Hm altered feldspathic sediments? HA
369		Banded carbonate (pp-wh-gn)
370.2	ClSeCo +Hm	Hm altered andesitic/dacitic derived sediments (no quartz; feld-hbl?)
422.1		massive white - banded carbonate
477.6	HmCoClSe	HmCo bands in andesitic/dacitic derived sandstones/breccias (fd-px/hbl?)
514.75	ClSe HmCo	Strongly HmCo altered original andesitic/dacitic sandstones/breccias (HA)
546.6		massive carbonate (pp-wh)
548.9		HmCo altered sediment
550.8		massive wh-pp carbonate
559		strongly altered andesitic/dacitic sediment
582.95	PySeSi(Ab)	monomict andesitic (fd-px/hbl) breccia
680	SeCl Ab	insitu andesitic (fd-px/hbl?) breccia (bas-and.)
700.8		coherent fd.px basaltic andesite
705		Sandstone with pink feldspars.
721.1		coherent fd-px basaltic andesite.
721.63		monomict breccia (basaltic andesite lithics)
723.8		Sandstone (fd-px xals); distinct pink feldspars
759.8		coherent fd-px basaltic andesite
763.8	SiSePy	monomict breccia (basaltic andesite lithics)
779.8		Sandstone with distinct pink feldspars
788		monomict breccia (basaltic andesite lithics)
813.8		coherent fd-px basaltic andesite
816		monomict breccia (fd-px lithics)
823		coherent fd-px basaltic andesite
824.5		monomict breccia (fd-px bas.and. lithics)
829.8		

LOG Andrew Jones CODES Newton Creek 1 HOLE NC1

date: 14/2/95 | grainsize | scale 1:200

m	structure	grainsize	ML MP	s	description	page of



0

Alteration banding 55°

Ab Si

Cl

10

Cl

20

Banding 55°

Fault

Cl

Ab Si

Banding 50°

30

Banding 45°

40

50

Massive quartz-feldspar crystal-rich sandstone
- little apparent grainsize variatio[n]
- clear angular/euhedral volcanic qtz
- euhedral feldspar crystals
- magnetite crystals minor
- alteration banding commonly developed
  - alternating AbSi and C[l] bands

(Mount Julia Member of the Tyndall Group)

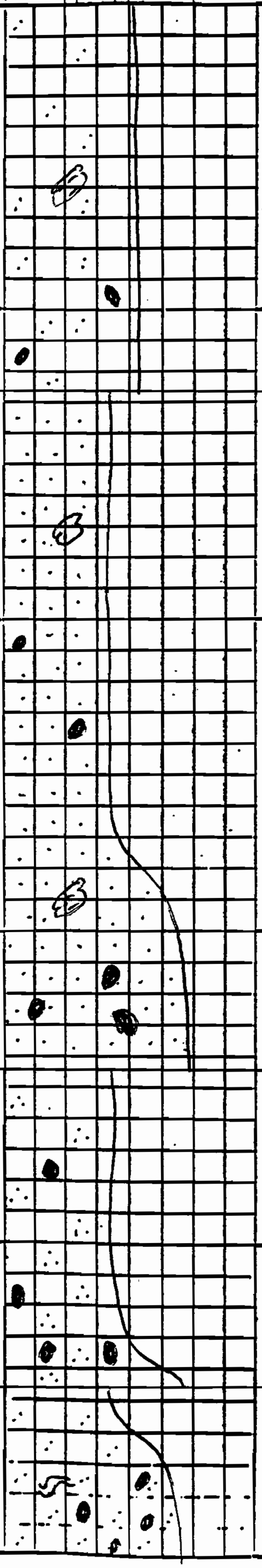
- Cl and AbSi banding

- clasts of black shale and aphyric pp and orange rhyolite

LOG

HOLE NC1

date: | scale 1:200 | page 2 of 17

m	structure	grainsize	ML MP	S	description
50–62.7 (50, 60, 62.7)	Fault]		5cm		Very crystal-rich fd-qtz sandstone - clasts of black mudstone and aphyric rhyolite - ~40% crystals - patchy AbSi and Cl alteration bands not well defined as at top of hole.
62.7–84.3 (70, 80, 84.3)			5cm	AbSi Cl	Fd-qtz xtal-rich sandstone/breccia -rounded/subrounded lithics throughout with lithic-rich base -lithics of black shale and orange aphyric rhyolite - get AbSi alteration around clasts - sandstones are massive
84.3–94.8 (90, 94.8)			10 cm		Crystal-rich fd-qtz sandstone/conglomerate - fd crystals > quartz crystals - rounded clasts of orange fd-phyric dacite, purple qtz-fd rhyolite
94.8–100 (100)				AbSi	Fd-Qtz sandstone/conglomerate -clast-rich base -clasts of fd-phyric pumice, chert, fd-phyric orange/and purple dacite

LOG

HOLE NC1

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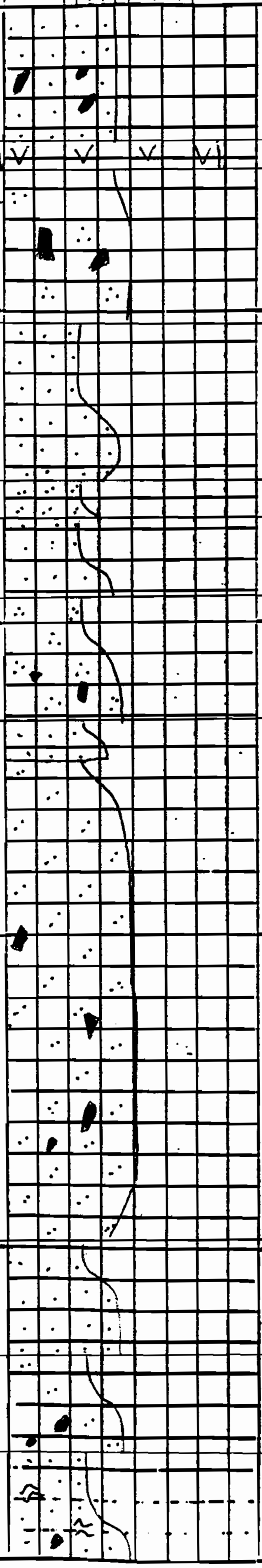
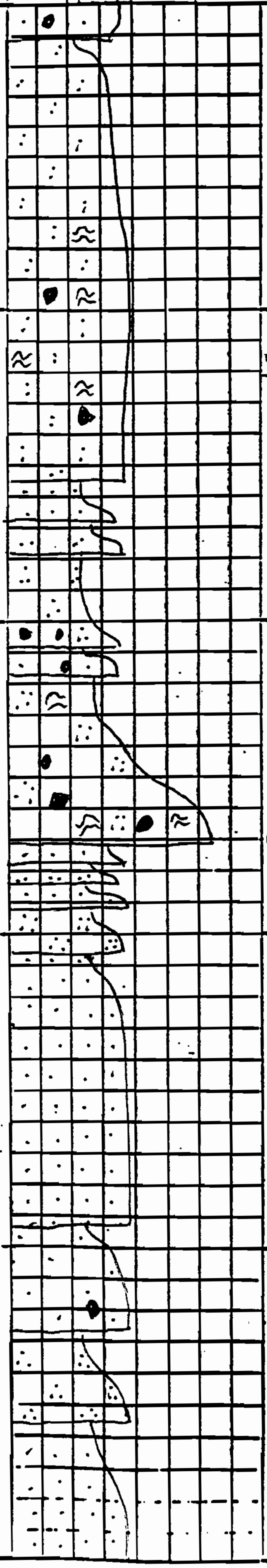


m	structure	ML MP	S	description
100	Banding 60° magnetic	3.5 cm		Fd-qtz crystal-rich sandstone - clasts subrounded of chert and orang aphyric rhyolite
	FAULT			Fd-px basaltic andesite dyke = intrusive chilled mar
	MAGNETIC	10 cm	Py	Fd-qtz xal-rich sandstone Fd > qtz - disseminated pyrite - clasts of orange rhyolite / purple dac
110	Banding 60°		Cl Ab Si	Bedded siltstone / sandstone - fd-qtz xal-rich (80:20) - younging uphole - slight reverse graded base
			Ab Si	Siltstone - m.g. fd-qtz sandstone
	Banding 65°		Ab Si	Siltstone top / fd crystal sandstone base
120	Banding 70° magnetic	2cm	Ab Si Cl	Siltstone - fd-qtz sandstone - lesser crystals at base - Ab Si alteration haloes around rhyo clasts - bands of magnetite at top
	Banding 45°	½cm	Ab Si Cl	Fd-qtz siltstone / sandstone - volcanic derived (rhyolitic) - clasts of aphyric rhyolite and dacite - magnetite crystals abundant - reverse graded base
130		7cm		
140	Banding 60°		Ab Si Cl	Siltstone / feldspar sandstone - Albite alteration banding - patchy chlorite alteration
	Banding 55°	1cm	Ab Si Cl	Fd crystal sandstone - thin magnetite bands - f.g. siltstone clasts
150		12cm		Fd ± qtz xal sandstone - magnetite bands - feld-phyric pumice clasts, and fd-phyric purple dacite clasts

LOG

date: | grainsize | scale 1:200 | HOLE NC1

m	structure	grainsize	ML MP	S	description
150				Ab	less crystals at base
151.4				Si	Siltstone / fd crystal sandstone
				Cl	- clasts of ragged cl altered fd-phyric pumice
155.5					- clasts of purple dacite (fd-phyric) and orange rhyolite
				Cl	
160			5cm	Ab Si	
					AbSi banded fd siltstone / sandstone - mt bands too (detrital)
	Ab/Mt banding 50°				
170				Ab	
	Ab banding 50°				Siltstone / fd - qtz crystal sandstone/breccia - fd > qtz - angular clasts of dacite, rhyolite and fd-phyric pumice. - AbSi and Cl alteration banding
			4cm	Ab Cl	fd - qtz siltstone / sandstone - graded units - younging uphole - fd crystals > qtz crystals - Ab Si alteration banding alternates with Cl banding - magnetite throughout
180				Cl Ab	
	Ab banding 50°			Cl	
190				Ab	
	Ab banding 55°		1cm	Cl Ab	
				Ab	
				Cl Se	
200					



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LOG

HOLE NC1

date: | grainsize | scale 1:200

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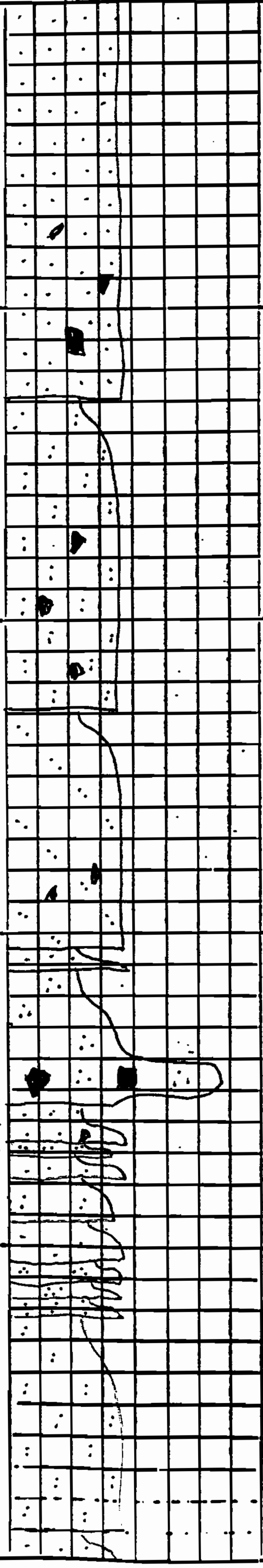
m	structure	grainsize	ML MP	S	description
200				Co	coarse grained feld-qtz crystal sandstone - clasts of aphyric dacite/rhy (angular)
210			6cm		
				Ab	Siltstone / feldspar xal-sandstone - euhedral feldspar crystals - about 25% xals - rhyolite lithics - Ab/Cl diffuse banding
220				Cl	
			2cm	Co	Siltstone / fd sandstone - AbSi banding (bands 2-3cm) - purple dacite and orange rhyolite clasts
230	Albite alt. banding 22°		9 cm	Ab Si Cl	Fd-qtz xal-rich siltstone/sand - younging uphole - clasts of angular fd-phyric dacite and orange aphyric rhyoli - Albite alteration banding - bedded tops to units
			1cm		
	Magnetite bedding 35°				
240				Ab Cl	
	Ab banding 35°			Ab Cl	
250					



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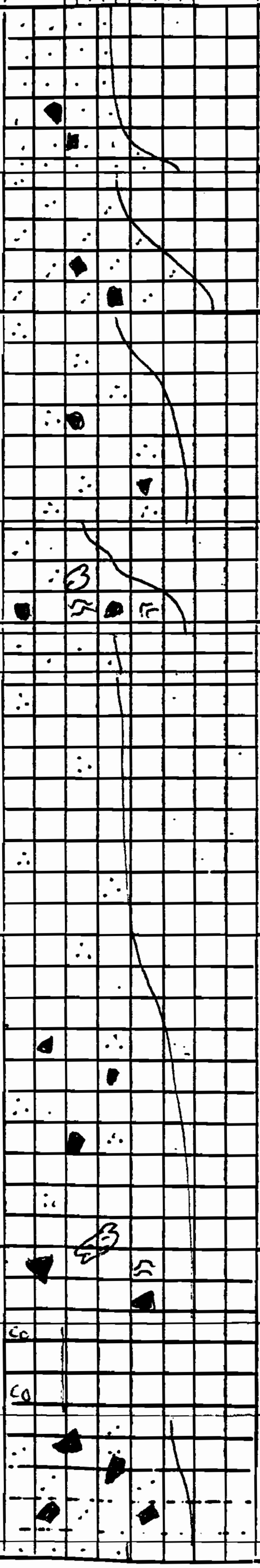

m	structure	ML MP	S	description
250		Ab 3cm	Ab	Fd-qtz xal sandstone / breccia - angular clasts of dacite and qtz-fd rhyolite
255.5		5.5 cm; 9cm		Fd-qtz sandstone / breccia -rhyolite/dacite clasts
260		8cm	Ab	Fd-qtz xal-rich sandstone - angular clasts of purple dacite and orange fd-qtz rhyolite - xals in sandstone euhedral (juvenile)
266.98			Ab	Fd-qtz sandstone / polymict conglomerate - orange rhyolite, black shale and fd-phyric pumice clasts - albite alteration around clasts
270				
270.16				Fd-qtz xal. sandstone
271.44			Ab	Massive fd-qtz xal sandstone/ breccia - xals euhedral (unreworked) - angular clasts of black shale, fd-porphyritic sandstone, qtz-fd porphyry - no bedding
280	Albite alteration banding 45°		Ab Cl; Ab	
290		13cm		
292.28	cleavage			white massive limestone - sandstone contamination
295.16	cleavage 60° co veins	18cm	Cl Hm Co	Coarse grained sandstone/ breccia - cleaved - clasts of chlorite altered siltstone and orange qtz-feld rhyolite
299.4	Fault		Cl	feld-qtz sandstone
300				

LOG

HOLE NC[illegible]

date: | grainsize | scale 1 : 200 | page 7 of

m	structure	ML MP	S	description
300	Fault Co veins	8cm 11cm		Coarse grained feld-qtz xal sandstone / brecc[illegible] - clasts of black mudstone, fd-qtz porphyry, orange aphyric rhyolite
303.5	Cleavage 60°			Siltstone / feld-qtz sandstone
304.7	Cleavage 62°			Feld-qtz xal-rich sandstone - angular coherent rhyolite clasts
306.55	Banding 83°			Bedded to massive white carbonate
307.95	Cleavage 38° Fault Cleavage 60°		Hm	Intensely hematite altered fd-qtz sandst[illegible] with banded carbonate - carbonate could be replacing sandstone - appears to be partly pumiceous?
310				
	Banding 65°		Hm	Banded / Massive limestone
	Cleavage 55° Cleavage 50° Cleavage 65° Banding 45° Co/Qtz vein Fault Cleavage 62° Cleavage 60° Banding 70°		Hm Hm Hm Cl Se	Hematite altered sediments and banded white/red/pink carbonate - can still see remnant cryst[illegible] in sandstones which have bee[illegible] overprinted by limestone - feldspar is the remnant cryst[illegible] with no quartz observed
320				
330				
340				
349	Banding 75°			Cleared / Banded wh/or/red limestone
350				

LOG

HOLE NC1

date: | scale 1:200 | page 8 of

m	structure	grainsize	ML MP	s	description
350		Co			Massive carbonate
	Cleavage 60°			Hm Cl Se	Cleaved strongly Hm/Cl/Se altered original sandstones/siltstones -overprinted by carbonate -limestone depositing overprints
360	cleavage 70°				
	Cleavage 72°				
	Banding 72°	Co			White/purple/green banded limestone
370	Cleavage 70°			Hm Cl Se	Strongly cleaved Hm/Cl/Se altered andesitic/dacitic sandstones - possible remnant hbl now Chloritised - these strongly altered units probably Anthony Road Andesite
	Cleavage 64°				
	Cleavage 70°				
380	Fault				
	CoQtz veins				
	cleavage 80°				
	cleavage 85°				
	Co veins (1cm)				
390	Cleavage 80°				
	Cleavage 75°				
400					

LOG

HOLE NC1

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m	structure	S	description
400	cleavage 78°		Strongly cleaved Hm/Cl Se altered andesitic/dacitic sandstones
		Hm	- chlorite alters crystals
		Cl	- sericite alters matrix
	Cleavage 70°	Se	- some carbonate banded
410	Cleavage 75°		
	cleavage 77°		
	cleavage 78°		
420			
422.1	Banding 63°		Massive white limestone with areas of red/purple/green band limestone
			- open space fill textures in some areas
	Banding 70°		- minor sandstone (volcanic) component
430	Banding 75°		
	Banding 82°		
440	Banding 75°		
446.9	Banding 70°	Hm Cl Se	limestone with lesser areas of feldspathic sandstone (altered)
450			

LOG

date: | grainsize | scale 1:200 | HOLE NC1 | page 10 of 17

m	structure	ML MP	S	description
450	Banding 75°			Original volcaniclastic sandstone . now replaced by limestone - carbonate clasts (red) surrounded by a second generation of white carbonate
	Cleavage 75°			
460				
460.2	Banding 65°			Banded to massive limestone - banded areas different colours including red/white/purple - lots of hematite - massive areas white - no fossils observed
470	Banding 67°			
	Banding 65°			
477.6				Andesitic sandstone/breccia replaced by Hm Co alteration - Intense areas of hematite - carbonate clasts also in breccia
480	Banding 75°			
	Cleavage 75°			
490	Cleavage 75°			
	Cleavage 80°			
498	Cleavage 80°		Se Cl	Cleaved andesitic/dacitic breccia
500				

Grain-size column annotations: Co (460.2 m), Co, Co, Co (477.6 m)

LOG

HOLE NC1

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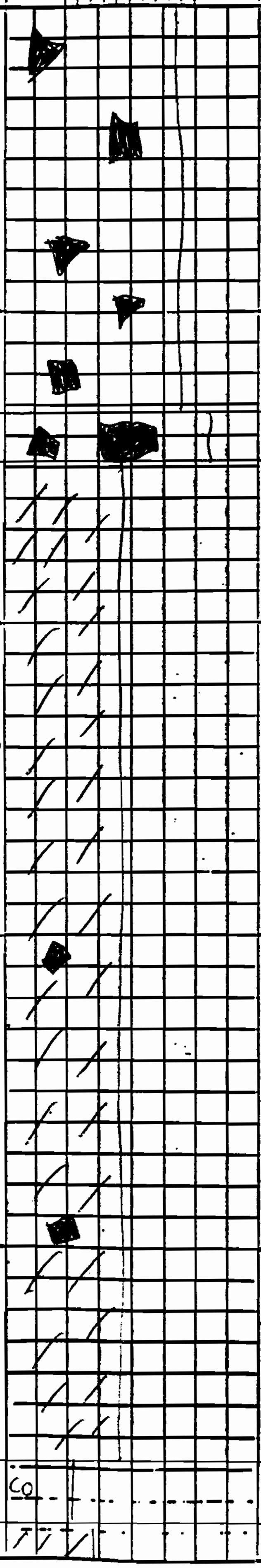
m	structure	ML MP	s	description
500	cleavage 80°	17 cm	Se Cl	angular clasts of fd-px/hbl? phy andesite / basaltic andesite - very altered and cleaved - clasts elongate with cleav - matrix andesitic - cleavage has variable orientation
510		22 cm		
		17cm	Se Cl	Altered fd-hbl andesitic breccia
	cleavage 85°		Hm	Strongly cleaved and SeClHm altered andesitic sandstone/brecc - angular clasts of altered fd-px/hbl coherent - lots of feldspar in units - strong orange/white carbonat veening
520			Co	
	Clearage 87°			
530	cleavage 75°	14cm		
540		30cm		
				White massive limestone
550	cleavage 87°			HmCo altered sandstone



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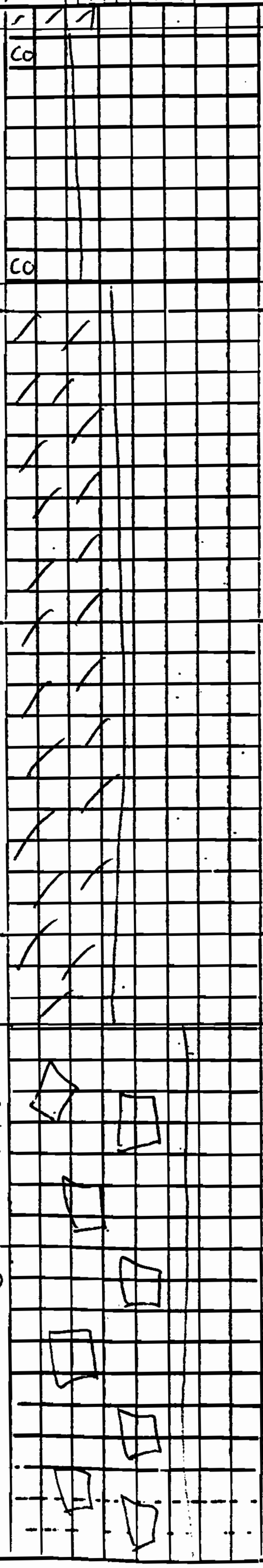
HOLE NC1

date: | grainsize | scale 1:200 | page 12 of

m	structure	grainsize	ML MP	s	description
550				Se	andesitic fd-px/hbl? sandstone
				Cl, Hm	Massive white/purple limestone with lenses (<60cm) of altered sandstone
559 / 560	cleavage 80°			Hm	Strongly altered (Hm Co) and cleaved andesitic fd-px/hbl? sandstone - limestone zones to 80cm (orange - white) - hematite strong
570	cleavage 80°				
580					
	Cleavage 70°				Monomict? basaltic/andesitic brecc - angular clasts to 25cm (average < 5cm) - sand grade matrix - clasts SeCl altered (feldspar to chlorite) - clasts could be fd-px basalt andesite?
590	Cleavage 75°		25 cm		
600					



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HOLE NC[illegible]

date: | grainsize | scale 1:200

m	structure	grainsize	ML MP	s	description
600	cleavage 60°				Apparently monomict breccias
					- clasts angular of fd-px basaltic andesite?
				co	- not jigsaw fit
	cleavage 85°				- coarse grained basaltic matrix
610					- carbonate filled vesicles and amygdales
	Py bands				
				Py Se Si	strong pyrite banding and Sericite / quartz alteration
620	Cleavage 70°				
630	Cleavage 65°				
	cleavage 85-90°				
640	Cleavage 75°				
650					

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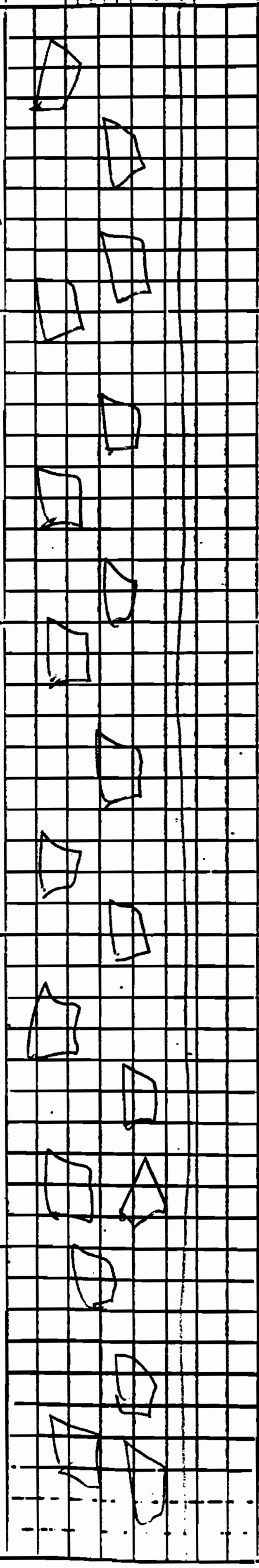

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HOLE NC1

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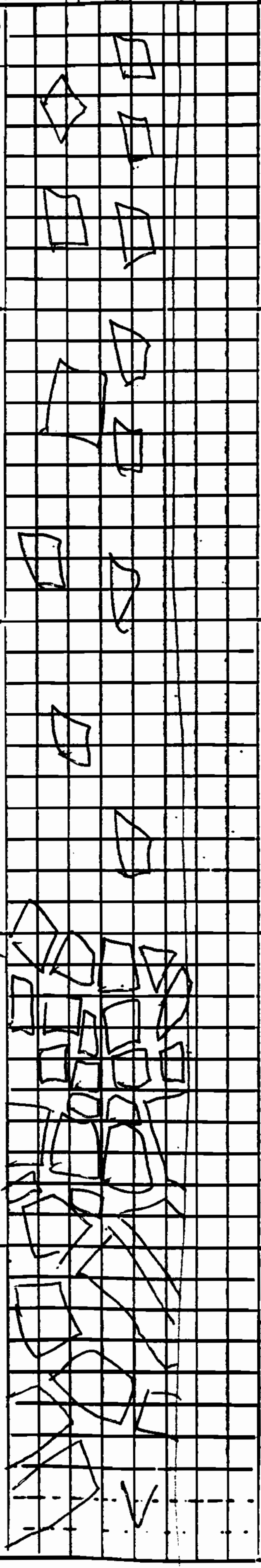
m	structure	grainsize	ML MP	S	description
650	cleavage ~90°			Se Si Py	Strongly cleaved monomict basaltic andesite breccia - clasts angular - strong Se Si Py alteration - clasts of fd-px basaltic andesite? - sizes vary from <1cm to ~10cm
	Pyrite ↑ bands ↓				
660			10cm		
	cleavage 85°				
670				Ab	
	cleavage 85°		10cm		
680				Ab	Breccia still the same but has an apparent jigsaw fit texture of angular fd-px basaltic clasts - albite altered - clasts angular varying in size from ~1cm – 7cm
			7cm		
690	cleavage 65°			Ab	
700					

LOG

date: | grainsize | scale 1:200 | HOLE NC | page 15 of

m	structure	grainsize	ML MP	S	description
700				Ab Se Cl	Coherent? fd-px basaltic ande[site] - seCl alteration quite strong - px altered
710	cleavage 80° / Cleavage 75°			Ab Se Cl	Feldspar xtal-rich sandstone - feldspars are euhedral and pink due to albite replace[ment] - seCl alteration of fine grained matrix
720					Coherent dyke of fd-px basalt?
730	cleavage 65°			Ab Cl Cl	Feldspar xtal-rich sandstone - feldspar crystals are pink - strongly cleaved - massive with no bedding obvious - could be strongly altered coherent? but think is sandstone
740	cleavage 85°				
	Cleavage 75°				
750					

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HOLE NC1

m	structure	grainsize	ML MP	S	description
750	cleavage 78°				Feldspar xal sandstone
759.8	Cleavage 75°				
760				Se Cl	Coherent fd-px basalt andesite – chlorite vesicles; phenocryst-rich
762.3			5cm	Cl	Monomict basaltic andesite breccia
763				Se	Coherent basaltic andesite
763.8	Fault		8cm 23cm	Cl Se Cl	Monomict breccia – clasts angular 1–8cm – clasts of ~~fd~~-px-porphyritic basaltic andesite
770	cleavage 87°			Al Se	Feldspar xal sandstone – orange due to SeAb alteration
	Pyrite alteration		3cm 1cm	Py Py Py	Monomict breccia – fd-px basaltic andesite? clasts – jigsaw fit texture in a few areas
780	cleavage 78°		25 cm	Se Si Py Ab	Feldspar xal-rich sandstone – feldspars are pink – sesiPy alteration of fine grained matrix – angular clasts of fd-px basaltic andesite
790	cleavage 70°			Si Se	Cleaved and SeSi altered breccia – sandstone matrix – clasts of fd-px basaltic andesite
800	cleavage 75°		2cm	Si Se Cl	Intense Si SeCl altered feldspar sandstone

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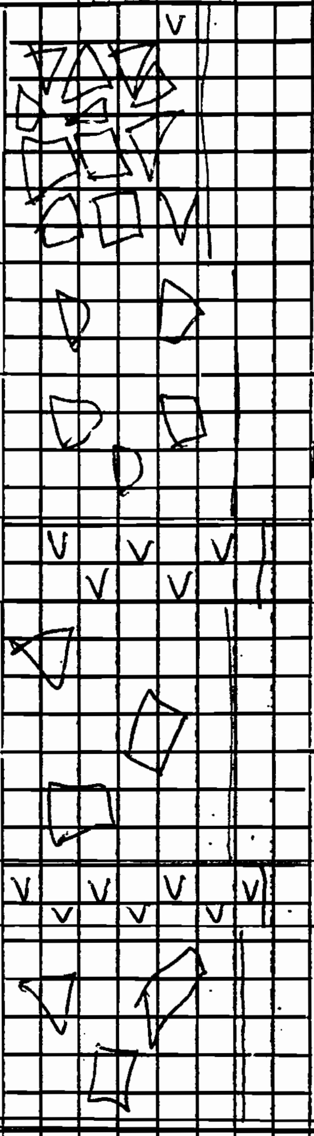
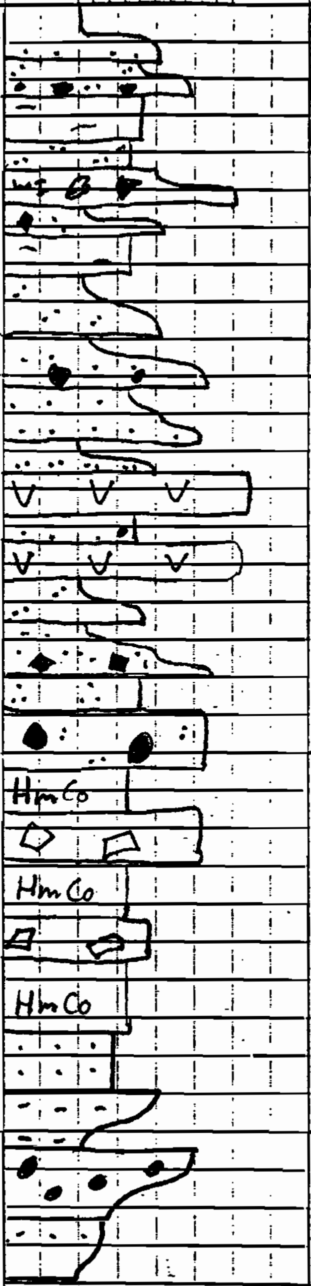


m	structure	ML MP	S	description
800			Si Se Py	Silica/sericite/pyrite altered fd-px basaltic andesite clast-r insitu breccia
810		10cm	Si Se Py	Intensely altered - assume is breccia
				Coherent fd-px? basaltic andesite - fd phenocrysts 3-4mm
820		15 cm >20 cm	Se Cl	Monomict breccia - clasts angular and >20cm in places - matrix fd xal sandstone - clasts of basaltic andesite
				coherent basaltic andesite
829.8			Se Si Py	Monomict breccia - clasts of fd-px basaltic andesite - sand matrix (se altered) - plag in matrix is pink
				E.O.H. NC1 829.8m
				* the last 300m of NC1 are very altered and recognitio of primary rocktype is difficu

LOG Andrew Jones Summary of Newton Creek 2	HOLE NC2
date: grainsize scale none	

m	alteration	grainsize	ML MP	S	description
	minor AbSiCl				Volcanic shales - fd-qtz xal-rich sandstones fd-qtz xal-rich sandstones to lithic-conglomerates
75.4	AbSi?				distinctive brown Fd-qtz unit with Cl alt domains
119.6					
125.5	AbSi Cl				AbSi - Cl banded fd-qtz xal-rich sandstone c.g. sst/breccia (welded ignimbrite lithic at 132m) Fd-qtz sandstones + lithics
139.15	AbSi?				distinctive brown fd-qtz unit (similar to 75.4-119.6)
162.20	AbSi Cl				fd-qtz graded siltstones/sandstones. sandstones to conglomerates
185.88					AbSi - Cl banded qtz-feld xal rich sandstones to cong.
321.75					Volcanic mudstones to qtz-feld sandstones
379.55					Feldspar - pyroxene phyric basaltic andesite dyke
381.75					Fd-qtz - lithic sandstone
384.92					Feldspar - px phyric basaltic andesite dyke
386.65					Fd-qtz sandstones to breccias (some lithics of banded carbonate)
429.70					
464.30	HmAbCo Se Cl				Feldspar xal (highly altered in places) sandstones Andesitic lithic + andesitic/dacitic derived sandstones
475.05					Feldspathic sediment with HmCo banding
477.95					Unit same as below (Se alt) Fd-dacite lithics ?
483					HmCo banded sediment
485.92					Fd dacite lithics in sandstone ?
486.6					HmCo altered sediment
494			FAULT		grey siltstone
505					qtz rich sandstone - siltstone conglomerate (rounded quartzite lithics) qtz siltstone - mudstone (well bedded)
631.60					



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LOG Andrew Jones Summary of DDH NC3

HOLE NC3

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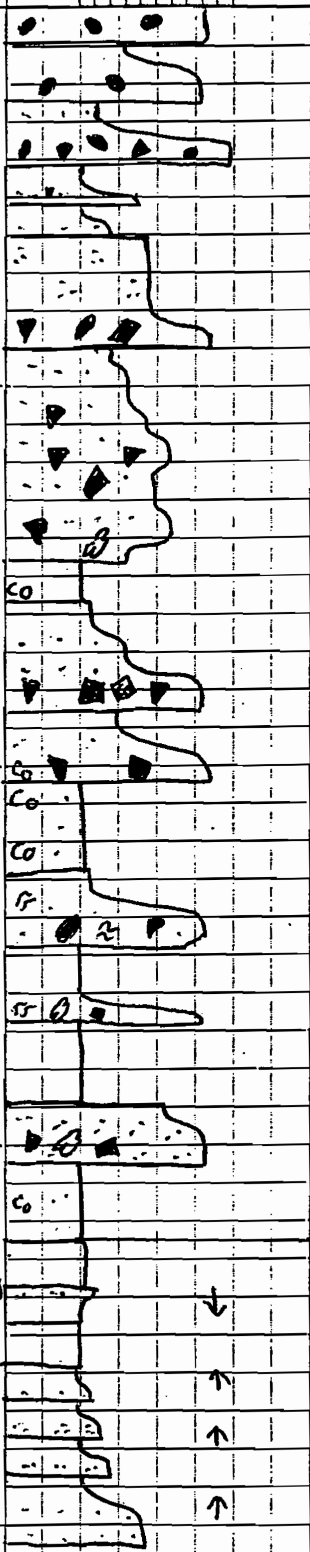

Unit	m	Alteration	ML MP	S	description
Upper Tyndall Group (Magnetic)	5.3				Polymict conglomerate with mud + xal (fd-qtz) matrix
	11.45				Feld+qtz+mud sandstone – polymict conglomerate
	60.90				Siltstone ~ polymict matrix supported breccia
	83.16				Grey volcanic mudstone – sandstone
	96.20				Grey volcanic mudstone – siltstone
Upper Comstock Tuff (magnetic)		AbSi Cl			AbSi - Cl banded feldspar-qtz xal-rich volcaniclastic sandstone to polymict breccia
	218.75	AbSi Cl			Volcaniclastic units of feldspar-qtz xal-rich siltstone – sandstone – matrix supported polymict breccias (Lithics of orange rhyolite/purple qtz-feld coherent/chert/mudstone/feld pumice?)
	361.15	SeCo			Massive white/grey carbonate
	387.50	Cl+Ab			Green/Grey siltstone/mudstone – fd-qtz xal-rich sandstone – polymict breccia (carbonate lithics)
~~458.80~~ Lower Comstock Tuff (non mag)	440.6	ClSeSiAb			Siltstone to matrix supported breccias; feld-qtz xals but abundant f.g. muddy matrix
	514.5				Massive carbonate – banded carbonate – white dirty silty carbonate
	624.65	SiSeCl			Grey mudstone – polymict breccia (mudstone/coherent/tube pumice lithics; fd-qtz matrix)
	635.9	SiSe			Grey mudstone – polymict base with pumice/black mudstone/coherent lithics; fd-qtz xals
	652.70				Black/grey mudstone (laminated top)
	687.90	SiSe			Fd-qtz sandstone – polymict conglomerate (lots of mud grade material) (fd-hbl lithic) 700m
	711.60	ClSeCoPy HmSeClPy			White massive carbonate – banded carbonate – Carbonate mudstone mixture
	764.2	T minor Co ± Py	Fault		Laminated grey mudstones (non graded)
	769.7				Siltstone – mudstone (facing downhole)
	777				Laminated grey mudstones
	785				Laminated grey mudstones – siltstones (facing uphole)
	875.8				Grey mudstone – siltstones (carbonate in siltstones)
	880.8				Interbedded grey mudstones – siltstones
	900.5				Mudstones (grey) – sandstones (sandstones with qtz and f.g. carbonate. (Younging uphole)
	1081.2				

EOH 1081.20m

LOG A. Jones CODES Summary of DDH TYN1 (Core held by RSC Q'town)

HOLE TYN1

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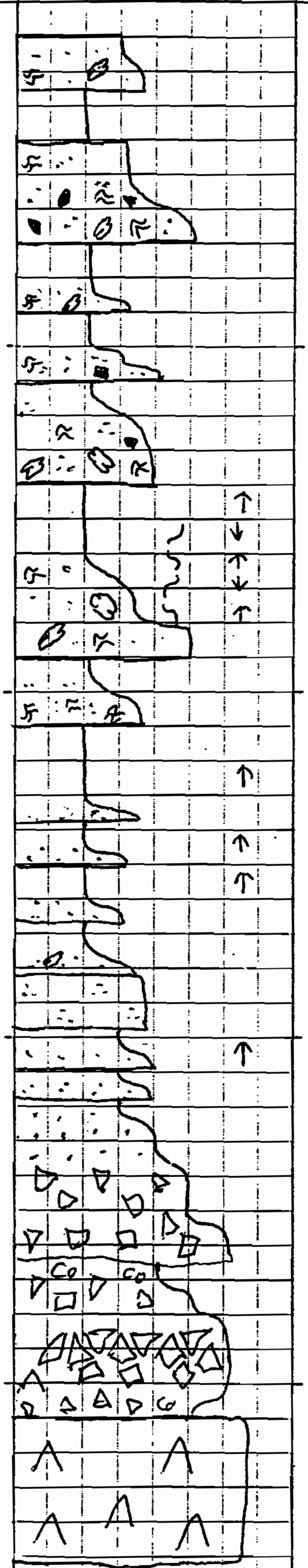

m	Alteration	ML MP	S	description
28.96	SiSe			Qtz-fd-xal + tube pumice bearing siltstone-sand stone (shale flecks throughout)
53.45	Py			Grey/Black laminated mudstone/siltstone
73.30	SiSe			Feld(+minor qtz) sandstone – polymict conglomerate (Lithics of black shale/white chert/qtz coherent/pumice)
78.20	SiPy			Grey siltstone/mudstone – feldspathic sandstone (laminated)
80	SiPy ClSe			Grey laminated mudstone – siltstone (Chlorite altered tube pumice in base)
85.65	SiSe			Grey siltstone – tube pumice sandstone (Polymict)
92.35	SiSe ⊥			Grey/Green mudstone – black mudstone grading into feldspar(+minor qtz) + black shale lithic + pumice sandstone/breccia
114				Black mudstone – grey siltstone – feldspathic pumiceous sandstone
118.75				Black mudstone to siltstone base (siltstone with fd + qtz xals)
130.34				Black mudstone to siltstone (fd+qtz)
				Black mudstone to siltstone (fd+qtz)
				Black mudstone to siltstone (intraclasts; fd+qtz xals)
156.83	T SeCo			~~Provenance Change~~
(andesitic)				Feldspar – hornblende sandstone
159.30	Se			Feldspar-hornblende siltstone/sandstone
162.48	SePy			Feldspar + hornblende siltstone/sandstone
163.60	SeCoPy SeCo SeCo			Andesitic derived feldspar-hornblende siltstone to sandstone to monomict breccia (Lithics angular to blocky)
185.30	SeEpCo			Breccia (monomict) of fd-hbl andesitic lithics (carbonate in matrix)
	AbSe			Insitu andesitic breccia (jigsaw fit texture)
	SeCo			Monomict andesitic breccia with carbonate matrix
205	Se SeAb Se			Coherent feldspar-hornblende phyric magnetic andesite
223.75				

EOH 223.75m (734')

LOG Andrew Jones - Summary of TYN2

HOLE TYN2

date:

grainsize

scale none

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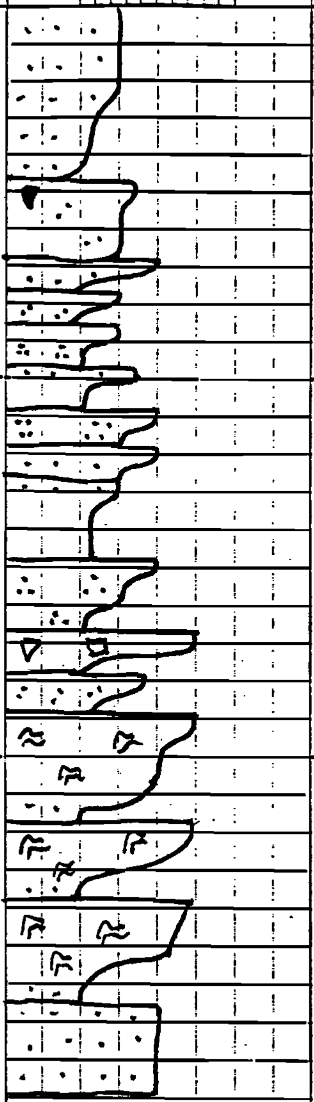
m	alteration	ML MP	s	description
	Se			Sandstone/siltstone / f.g. siltstone (not xal-rich; with no quartz; feldspathic)
144.5				f.g - m.g. sandstone/siltstone (feldspathic
173.7				feldspathic sandstones/siltstones/mudstones
177				feldspathic siltstone — black/grey mudstone
190.8				feldspathic sandstones
193.5	SeCo			feldspathic c.g. siltstones - black mudstone
209.4	SeSi			feldspathic sandstone/siltstone
221.6				breccia (fd-phyric lithics) - sandstone
				feldspathic sandstone - siltstone
225.9	SeSiCl			feldspathic pumice clast-rich units
239	SiSe			
246.3	SeSiCl			
252.8				Feldspar-xal sandstone
269.75				



LOG Andrew Jones | CODES | TYNDALL 002 | HOLE TYN 2

date: 23-24/8/94 | grainsize | scale 1:200

m	structure	grainsize	ML MP	s	description
0					

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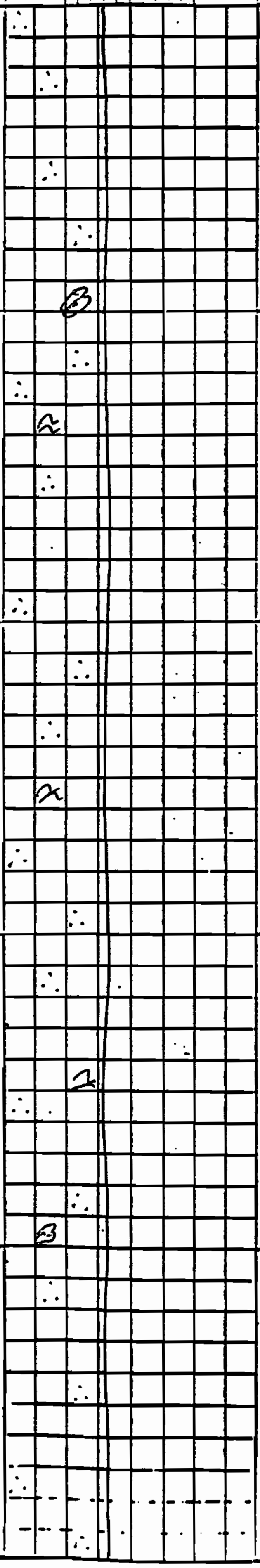
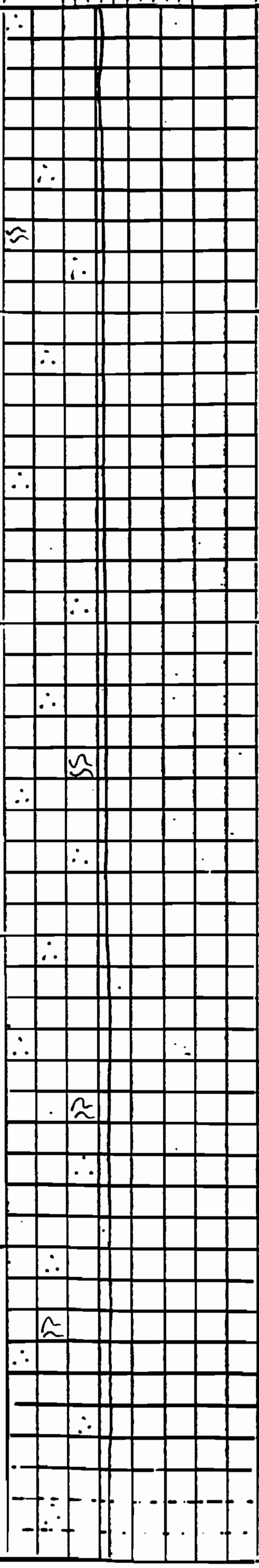


m	structure	s	description
0–10	non magnetic	Se	Fine grained feldspathic sandstone - contains very little if any quartz - feldspar xals to 4mm - contains black mudstone / and fd-phyric pumice - massive sandstone with no grading evident
10–20		Se	(Yolande River Sequence) - fine grained matrix (ash?) - chloritised mudstone flecks
20–30	non magnetic		
30–40		Se	
40–50	non magnetic	Se	

LOG

date:	grainsize	scale 1:200	HOLE TYN

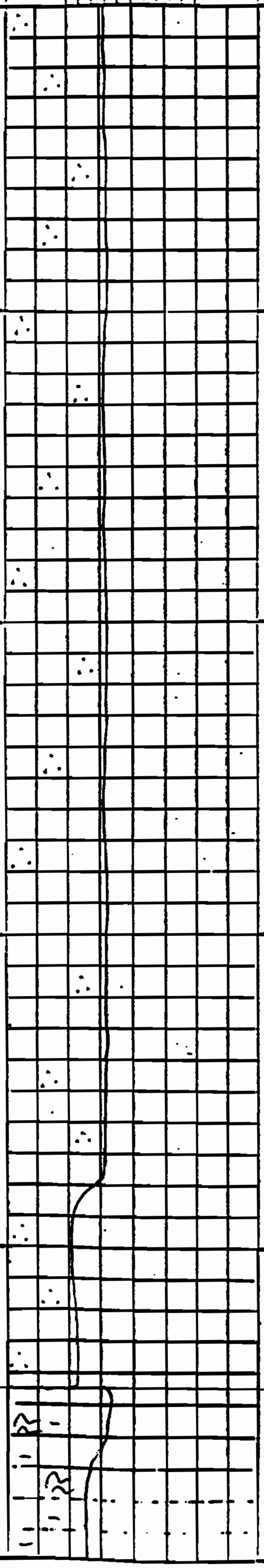
m	structure	grainsize	ML MP	s	description	page 2 of
50	non magnetic			Se	Continuing massive blue/grey . fine grained siltstone - contains minor pumice clasts - fd xals and fine grained ashy matrix dominant - no bedding - disseminated carbonate in places (Yolande River Sequence)	
60				Co		
				Se		
70	non magnetic					
80				Se		
90	non magnetic			Se		
100						

LOG

HOLE TYN 2

date: | grainsize | scale 1:200

m	structure	grainsize	ML MP	S	description
100				Se	fine grained grey/blue feldspathic sandstone (with fd xals) -non bedded -massive -minor pumice-clast component -grades into finer grained top -younging downhole
110	non magnetic			Se	
120					
130	non magnetic			Se	
137.75					finer grained silts/mudstone - fd only; no qtz
140				Se	
144.5	non magnetic		6.5 cm	Se	Feldspathic siltstone -ragged fd-phyric pumice clasts (sericite altered) -fd xals and fine ash matrix
150					



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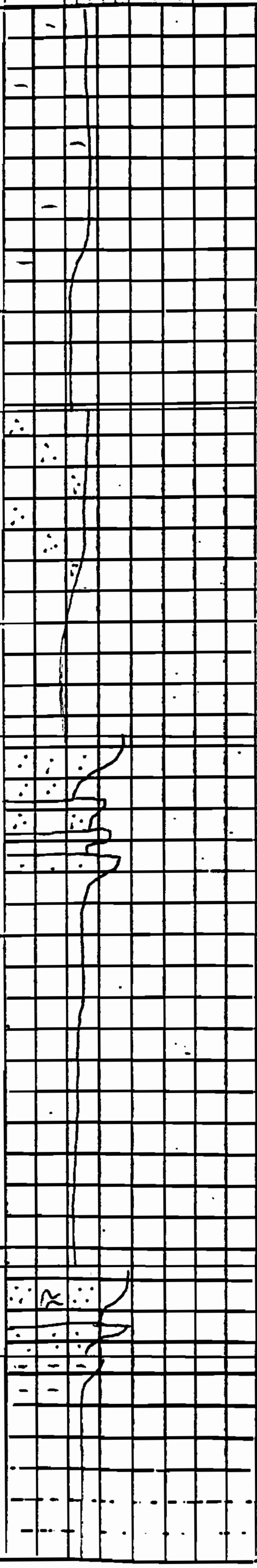
LOG

HOLE TYN 2

date: | grainsize | scale 1:200 | page 4 of

m	structure	ML MP	S	description
150	non magnetic			fine grained feldspathic siltstone
157.6				Black mudstone – laminated (1-2 mm) – bedding very disrupted
160				
163.2	non magnetic		Se	Massive siltstone – mudstone – feldspathic – thinly bedded/laminated tox
168.5				– younging downhole
170				
173.7	non magnetic			siltstone to mudstone – feldspathic
175.7				
176.7				
180				– laminated
183.1	non magnetic			
190				
190.6	non magnetic			Sandstone – siltstone – feldspar xals + pumiceous cla – younging downhole
192.4				
193.5			Co	repetitively bedded siltstone/mudsto – non laminated mudstone
200				



LOG

HOLE TYN 2

date: | grainsize | scale 1:200 | page 5 of 6

m	structure	ML MP	S	description
200 – 209.4	non magnetic		Co	thinly bedded volcanic derived siltstone\ mudstone (not pyritic pelagic mudstone)
209.4 – 221.6 (210, 220)	non magnetic		Se Si Cl Si Se Si	Fd xal sandstone – mudstone - non bedded - younging downhole - feldspar crystals euhedral - flattened chlorite altered pumice lenses throughout
221.6 – 224.3		6cm		Pumiceous breccia – mudstone/siltstone - ragged fd-phyric pumice fragments
224.3 – 225.9				Fd + pumice sandstone - dacitic
225.9 – 239 (230)	non magnetic		Se Si Cl Se Si	Pumice breccia - dominantly comprised of sise altered ragged fd-phyric pumice clasts - no bedding - slight grading - silica flooding locally
239 – 246.3 (240)			Se Si Se	Pumice breccia – mudstone top - dacitic - angular fd-porphyritic pomice clasts - non bedded
246.3 – 250	non magnetic		Si Cl	Pumice breccia - initial reverse grading then normal grading - dacitic

LOG

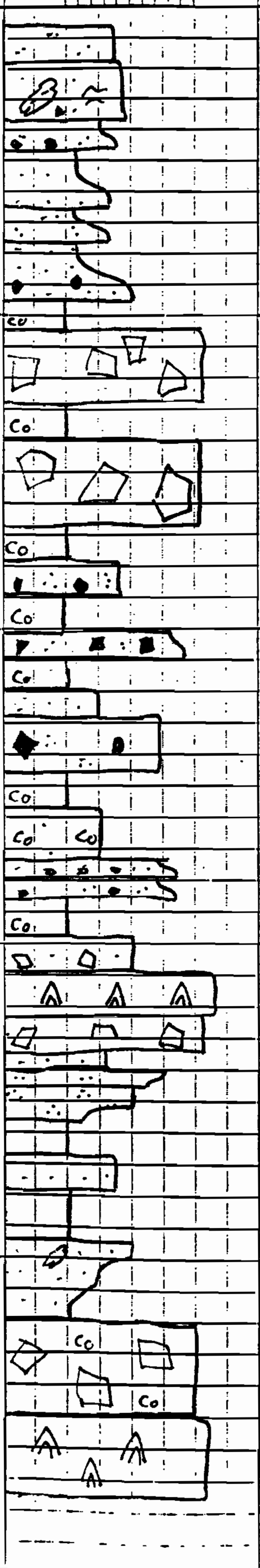
HOLE	TYN 2
date:	
scale	1:200
page	6 of

m	structure	grainsize	ML MP	s	description
250	non magnetic				Pumice breccia – thinly bedded grey mudstone
252.7	Qtz-Ca-Cl vein(x2) (80cm) (120cm)			Se Si Cl	Dacitic sandstone – sandstone contains subhedra rounded feldspar crystals – chloritised flecks of shale – Strong sericite alteration an local silica flooding – possibly pumiceous – no quartz
260	non magnetic			Se Si	
269.75					E.O.H. TYN2 269.75m (885")

LOG Andrew Jones — Summary of TYN3

HOLE: TYN3

date: | scale: none | page 1 of 1



m	alteration	ML MP	s	description
16.76				
32.30	SeCl			fd + minor qtz sist/sst
				fd-qtz-lithic sandstone; lithics shale, pumice, chert
62.80				fd sandstone
65.50				f.g. sist to feld sandstone base
97.23	Si			sist - feldspar poor sandstone
103.9				siltstone - coarser lithic (shale, chert) sandstone
113.6	Co			massive white carbonate
114.6	CoSeEpCl			monomict breccia; lithics of fd-hbl andesite
143.3	Co			massive white carbonate
145.1	EpSe			monomict breccias (fd-hbl andesite lithics)
191.1	Co			
192.9	CoHm			fd-qtz sandstones with siltstone + andesite? lithics
195.7	Co			massive white carbonate
197.8	Cl			polymict breccia; lithics of siltstone + andesite?
199.6	Co			massive white carbonate
201.2				fd-qtz siltstone
202.4	ClCoSe			Polymict (andesite? siltstone chert) - sandstones
210	Co			white massive carbonate
213.6	Co			carbonate - sandstone
220.1	Py			Breccias - sandstones (fd-hbl andesite lithics)
221.6				Banded carbonate (wh-gn-pk) - white massive co
229.1	Co			
231.7	SeCl			monomict fd-hbl lithics; fd-hbl sandstone
				coherent fd-hbl phyric andesite
235.9				monomict (fd-hbl phyric) breccia
241.7				fd-qtz sandstone
242.6				fd-qtz sandstones - siltstones
257.8				Black shales
261.1	Py			fd-qtz sandstone
279.8	SiSe			
	Py			black shales
294	SiSe			Sequence (4 units) of c.g. qtz-feld sandstone - black shales (mudstone intraclasts)
	Py			
331.3	SeClCoAb			monomict (fd-hbl andesite lithics) breccia with matrix carbonate filled
	Co			
348.3	SeClHmCo			
	SeAbEpCo			coherent fd-hbl andesite (brecciated in places & co matrix)
365.75				

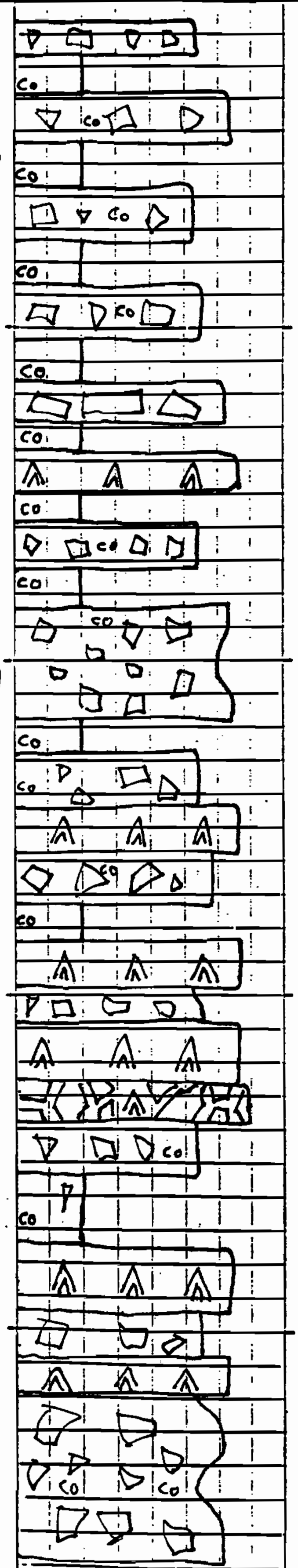
LOG Andrew Jones — Summary of TYN 4

HOLE TYN4

date:

grainsize

scale none



m	alteration	ML MP	S	description
36.4	HmAbCo			Breccia – sandstone of andesitic derivation (feld-hbl phyric lithics)
37.7				Diffusely banded rd-pk-wh-pp carbonate
41.4	SeClCo Hm ± EpAb			monolithic (fd-hbl andesite) breccia with carbonate matrix
43				massive – banded carbonate (wh-bl-pk)
47.1				monolithic (fd-hbl) breccia – banded carbonate
50.45				Gn-wh-pp banded carbonate
54.90				monolithic breccia (fd-hbl phyric lithics; matrix of c.g. banded-massive carbonate
62.65				banded wh-gn-pp carbonate
65.80				Fd-hbl phyric breccia - coherent
69.9				massive wh-pp carbonate
70.50				coherent fd-hbl phyric andesite
74.25				banded-massive gn-rd-wh carbonate
75.80	Hm Co			Brecciated fd-hbl andesite; carbonate matrix
78.85				Banded gn-rd-wh carbonate
88.40				Monomict breccia (fd-hbl phyric andesite; carbonate in matrix for some)
100	Hm EpSeCl			
130				Gn-wh-pp banded carbonate
131.15	Hm Co			monolithic breccia (fd-hbl andesite lithics) with some carbonate zones.
143.5				Fd-hbl phyric coherent andesite
146.5	Hm Ep Co			monomict breccia with carbonate matrix (fd-hbl andesite lithics)
161.70				Banded-brecciated wh-gngy-pp carbonate
162.5				Coherent fd-hbl phyric andesite
169.2				monomict (fd-hbl lithic) breccia; carbonate matrix
170.4	Hm Se Ep			Fd-hbl phyric coherent andesite
196				In situ (jigsaw fit) fd-hbl phyric andesite breccia
197.3	SeCl HmAb.			monomict breccia; zones of carbonate (fd-hbl lithics)
200.45	Hm Ab Co.			Banded carbonate (pp-wh) with fd-hbl andesite lithics
212.10	Hm Ep			Fd-hbl phyric andesite
216.4	Hm Se EpCo			monomict breccia (fd-hbl andesite lithics)
222.8	Hm Ep			Fd-hbl phyric andesite
229.2	HmSeClEp AbCo			monomict breccia (fd-hbl phyric lithics) zones of smaller breccia have carbonate matrix
250.4				

LOG Andrew Jones	CODES	Summary of TYNDALL 4	HOLE TYN 4
date: 30/3/95	grainsize	scale 1:200	page 1 of 6

m	structure	grainsize	ML MP	S	description
0 – 36.4					Glacials - quartzite conglomerates/quartz sandstones 0m → 36.40m
36.4 – 37.7			7cm	Hm Co	Monomict breccia/sandstone - Fd-hbl andesite derived
37.7 – 41.4	Banding at 40° to core	Co Co			Diffusely banded red-pink-white carbonate (limestone)
41.4 – 43		Co	23cm	Hm Co Ab	Monomict Fd-hbl andesitic breccia with carbonate matrix
43 – 47	Bands at 40-45°	Co Co			Banded white-blue-pink carbonate
47 – 50	Bands at 40-50°	Co Co		Se Cl Co	Alternating andesitic breccia to banded carbonate.

30

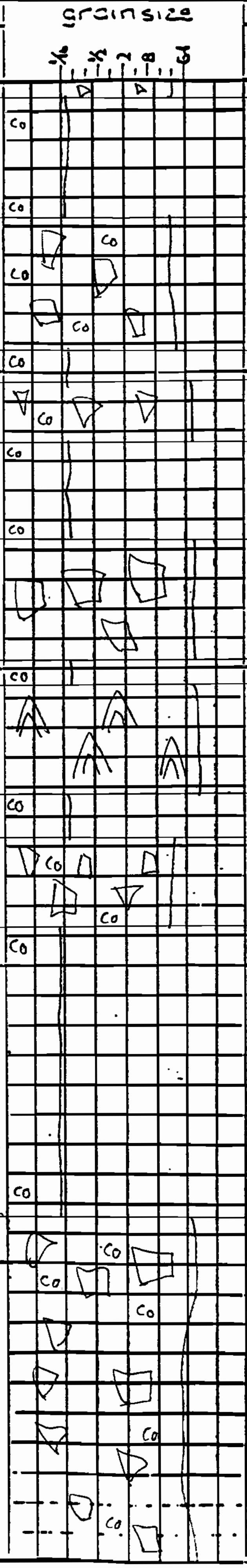
40

50

LOG

HOLE TYN

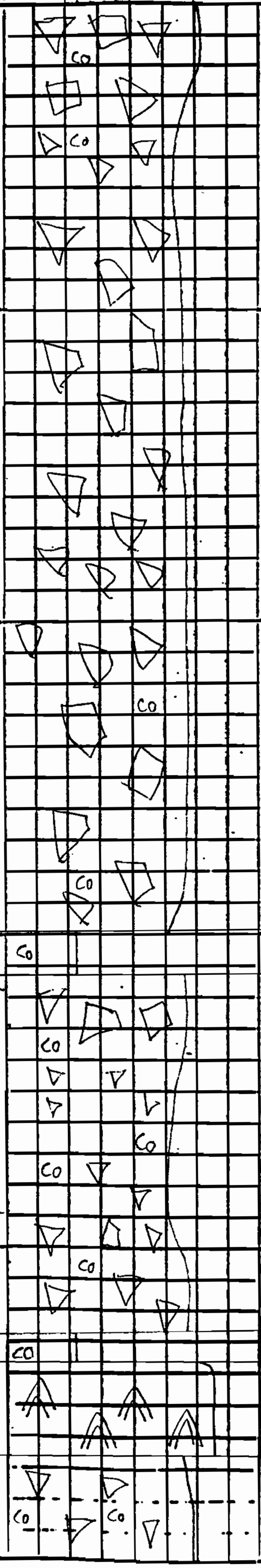
date: | scale 1:200 | page 2



m	structure	ML MP	s	description
50 50.45	Bands at 45°	18cm		Banded green-white-purple limestone
54.90	Bands at 40° magnetic	10cm	se cl Hm	Monomict breccia - clasts of fd-hbl-phyric andesite - banded carbonate matrix
59.45 60	Bands at 50°			Banded limestone
60.25	magnetic	21cm	se cl co	Monomict breccia with carbonate matrix - fd-hbl phyric andesite clasts
62.65	Bands at 45-50°			Well banded white-green-purple carb
65.80		33 cm	se Ep Hm	Monomict andesitic breccia - clasts of fd-hbl-porphyritic andesit - fd to 3mm; hbl to 7mm - carbonate in matrix
69.90 70				Massive carbonate
70.50	white co veins		se cl Ep Ab	Coherent fd-hbl-phyric andesite - fd to 3mm; hbl to 5mm - Albite altered
74.25	Bands at 40-60°			well banded carbonate - white/green/red
75.80		8cm	Hm Co	Monomict breccia with carbonate matrix - clasts of fd-hbl-phyric andesite - fd to 4mm; hbl to 4mm
78.85 80	Bands at 50° fault			well banded green-red-white limestone - fine grained siltstone material throughout
88.4 90	magnetic	710 cm 1-2cm 10cm	Hm Hm co	Monomict andesitic breccia with banded carbo - clasts of fd (to 3mm) - hbl (to 4mm) - p andesite - clasts are angular to blocky - carbonate fills the matrix betwee clasts
100				

LOG

date:	grainsize	scale 1:200	HOLE TYN 4	page 3 of 6



m	structure	ML MP	S	description
100	Fault	5cm	Hm Ep Se	Monomict andesitic breccia - clasts of angular fd-hbl phyric andesite - clast size varies - carbonate matrix
	Fault	4-5cm	Hm Ep Se Cl	
	Fault	17cm		
110			Hm Se Cl Ep	
		20cm	Hm Co	
120	magnetic	12cm		
		29cm		
			Hm Co	- fd to 3mm - hbl to 4m
		2cm		
130	Bands at 50°			Green-white-purple banded carbonate
131.15	Fault Bands at 42°		Hm Co Hm Co	Monomict breccia - clasts are fd-hbl-phyric andesite - banded carbonate fills the matrix - andesite clasts hematite altered
140				
142.8	Bands at 50°			Banded carbonate
143.5			Hm	Coherent hm altered fd-hbl porphyritic andesite - fd to 3.5mm - hbl to 3mm (hbl not always preserved)
146.5			Hm	Monomict fd-hbl-porphyritic andesite clast breccia - hbl's now hematite - feld preserved - carbonate in matrix
150				

LOG

HOLE TYN4

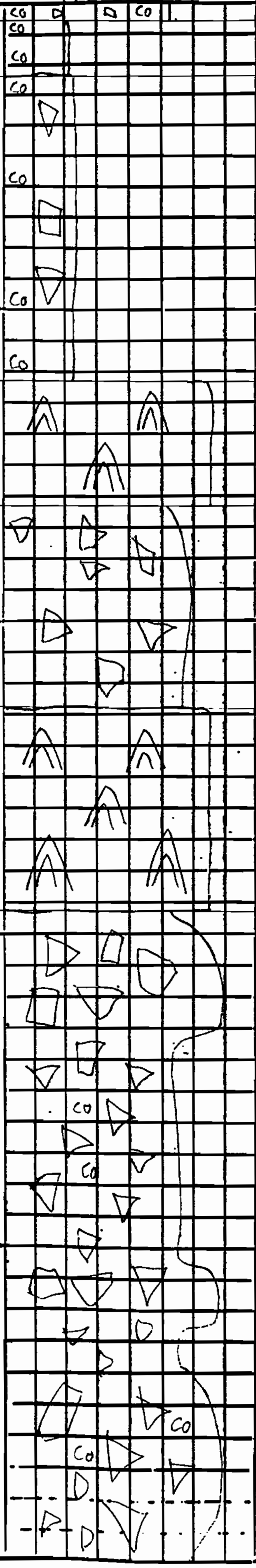
date: | scale 1:200 | page 4 of

m	structure	grainsize	ML MP	S	description
150 – 160 – 161.70	Ep Co veins (<2cm)			Hm Co Ep	Andesitic breccia
161.70 – 162.50	Bands at 60°	Co			Banded white-green-purple limestone
162.50 – 169.20	magnetic Ep veins			Hm Ep	Massive coherent fd-hbl-phyric andesite - strong hm alteration - fd phenocrysts to 4mm - hbl phenocrysts to 11mm - hbl contain < 1mm feld inclusions
169.20 – 170 – 170.40		Co	5cm		Monomict andesitic breccia/carbonate matri
170.40 – 174.60	magnetic (epidote veins)			Hm	Massive coherent fd-hbl andesite - hematite altered
174.60 – 179.40	Co veins (< 1cm)			Hm Se Co	Andesitic breccia - clasts of fd-hbl andesite - clasts angular - some areas have a jigsaw fit texti
179.40 – 180 – 190 – 196	magnetic			Hm Se Ep	Massive coherent fd-hbl andesite - hornblende phenocrysts to 3mm - Feldspar phenocrysts to 5mm - in places hbl is hematite altered and destroyed - Feldspar phenocrysts vary betwe white, pink (albite altered) and green (epidote altered).
196 – 197.30					Insitu andesitic breccia - clasts angular
197.30 – 199.40		Co Co	24 cm	Se Cl Ab	Monomict breccia - clasts of fd-hbl andesite - clasts angular
199.40 – 200		Co Co		Hm	Andesitic breccia with carbonate matr

LOG

HOLE TYN4

date: | scale 1:200 | page 5 of 6



m	structure	ML MP	S	description
200 / 200.45	Banding 75-85°			Finely bedded white-purple limestone - beds <5mm
202.40 (210)	Bands at 80° 60° 60°	39cm	Hm Ab Co	Banded limestone with andesitic clasts -clasts fd-hbl andesite -limestone bedded
212.10	magnetic		Hm Ep	Coherent fd-hbl andesite - fd phenocrysts to 4mm; hbl to 5mm -hbl either fresh or hm altered -feldspar fresh or epidote altered
216.40 (220)			Hm Se Ep Co	Monomict breccia with carbonate matrix -clasts of fd-hbl-phyric andesite
222.8	magnetic		Hm Ep	Coherent fd-hbl-porphyritic andesite - Flow banding weakly developed locally -hbl phenocrysts to 4mm -feld phenocrysts to 3mm
229.2 (230, 240, 250)	magnetic magnetic	5cm 23cm 36cm	Hm Se Cl Ep Ab Co	Monomict andesitic breccia -clasts of fd-hbl andesite -fd to 3mm -hbl to 5mm -phenocryst-rich -clasts variable sizes and alteration - HmAb - EpSe - SeClEp -carbonate (white) forms the matrix in finer brecciated areas.

LOG

HOLE TYN4

date: | grainsize | scale 1:200

page 6 of

m	structure	grainsize	ML MP	S	description
250					Andesitic breccia with carbonate matrix
250·40					E.O.H. TYN4 250·40m

LOG Andrew Jones — Summary of TYN5

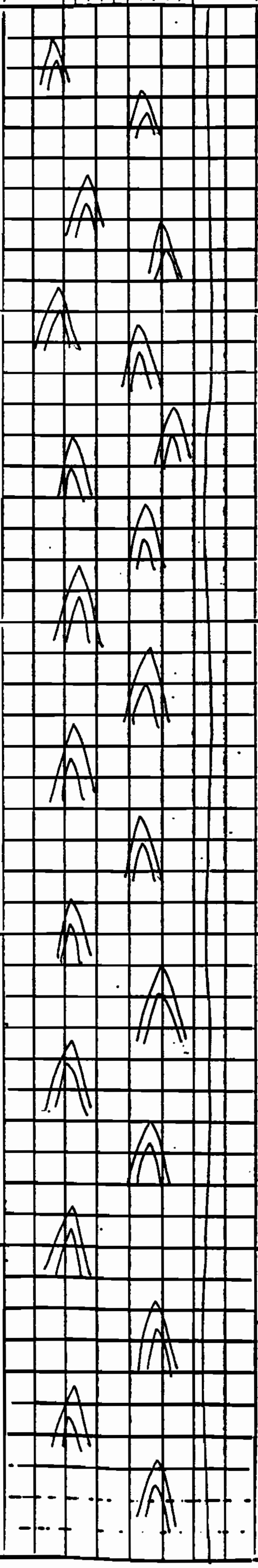
HOLE TYN5

date: | grainsize: 1/16 1/4 1/2 2 8 64 | scale: none | page 1 of 1

m	alteration	ML MP	S	description
16.6	SiSePy / Hm SeSi			Feldspar-hornblende-phyric coherent andesite
64.20				carbonate dominates with monomict (fd-hbl-phyric) lithics
67	HmAbCo			monomict breccia (fd-hbl-phyric) with carbonate in matrix
76.6				Wh-pk-rd banded (diffusely) carbonate
77.4				monomict (fd-hbl andesite) lithic breccia with carbonate matrix
80	AbHm ±ClSe			Fd-hbl andesite coherent
84.70				wh-pk-bl carbonate
87.90				coherent fd-hbl andesite
94.75				monomict breccia (fd-hbl andesite lithics), carbonate matrix
106.70				diffusely banded wh-or-gn-gy carbonate
108.50				monomict (fd-hbl) breccia with carbonate matrix
115.45				wh-rd-or diffusely banded carbonate
119	AbSePyCoHm			coherent to brecciated fd-hbl andesite
139				pk-wh carbonate
142.2				brecciated fd-hbl andesite with carbonate matrix
156.7				coherent to brecciated fd-hbl andesite
177.3	AbHmCo			breccia/sandstone of fd-hbl andesitic derivation with zones of carbonate
223.5				Polymict breccia (fd-hbl andesite, carbonate lithics)
226.3	±Ep			fd-hbl phyric coherent andesite
260	HmCo			massive carbonate to monomict (fd-hbl) lithic bx with carbonate matrix
276.8				fd-hbl coherent andesite
279.1	AbHmSeClPyCo			monomict (fd-hbl andesite) lithic breccia with carbonate matrix
296.60	SeClEp			fd-hbl phyric andesite
310	AbHmSe			monomict lithic breccia to sandstone (fd-hbl derived)
318	Co			Banded wh-gn-red carbonate
321.5	AbHmSe			Feldspar-hornblende andesite
346.6	HmAbSeClCo			monomict breccia with carbonate matrix (lithics of fd-hbl andesite)
350.8				banded red-wh-gn carbonate
351.7				fd-hbl coherent andesite
354.7				fd-hbl lithic breccia with carbonate matrix
356.4				coherent fd-hbl andesite
361				monomict breccia (fd-hbl) with carbonate matrix (carbonate massive to banded)
367.55				massive to poorly banded carbonate
368.8				monomict breccia (fd-hbl andesite lithics) with carbonate matrix
372.7				

LOG Andrew Jones | CODES | HOLE TYN 5

date: 24/3/95 | grainsize | scale 1:200 | page 1 of

m	structure	grainsize	ML MP	S	description
0	0m – 41m core very broken			Si Se Py	Fd-hbl-phyric coherent andesite/dacit - hornblende euhedral to 12mm - feldspar tabolar to 3mm -hbl abondant - weak flow foliation observed
	magnetic				
10					
					- core is vuggy in places
20				Hm Se Si	-very hematite altered -groundmass HmSeSi and Hm replaces hornblende
	cleaved at 60°				-hbl to 5mm - fd to 4mm - vugs
	non magnetic				(Fd-hbl andesite/dacite associatio
30	< 1cm Hm veins				of the Anthony Road Andesite
	magnetic cleaved at 50°				
40	50			Se	- Fd not as coarse as above (to 3mm
					Fd-hbl phenocryst-rich andesite -hbl to 7mm - fd to 5mm
	magnetic			Ab Ep	
50					

LOG

date: | grainsize | scale 1:200

HOLE TYN 5

m	structure	ML MP	S	description
50–64.20 (60)	Chlorite vein (15cm) Fault			Coherent feldspar-hornblende-phyric andesite
64.20–67.10	Banding 50° to core	3cm 1cm	Hm Ab	carbonate/breccia -pink/white banded carbonate with clasts of angular fd-hbl andesite
67.10–76.60 (70)	Banding 40° to core	75 cm	Hm Ab	Andesitic breccia /carbonate -angular lithics of fd-hbl andesite with carbonate matrix fill
76.60–77.40	bands 40°			white-pink carbonate diffusely banded
77.40–84.70 (80)	banding 30-50° magnetic		Cl Se Ab	Andesitic breccia with banded carbonate Coherent fd-hbl andesite carbonate coherent fd-hbl andesite
84.70–87.90	Bands 50-55°			Massive white/pink banded carbonate
87.90–90.3 (90)	Hm veinlets		Ab Hm	Fd-hbl albite altered andesite
90.3–90.7	Bands 45°			Fd-hbl clasts in carbonate
90.7–94.75	Fault magnetic		Ab	Coherent fd-hbl andesite -hbl to 6mm -fd to 4mm -phenocryst evenly dispersed
94.75–100	Banding at 60° magnetic	24cm	Ab	Monomict andesitic breccia with carbonate matrix -lithics large and angular -massive carbonate zones up to 28cm thick

LOG

date: | grainsize | scale 1:200 | HOLE TYN5 | page 3 of

m	structure	ML MP	S	description
100				
100·60 – 106·70	magnetic			Insitu fd-hbl albite altered andesitic brec - matrix carbonate filled - clasts angolar / blocky
106·70 – 108·50	Bands 55°			white - orange - grey banded carbonate
108·50 – 115·45 (110)	magnetic	4cm 35cm		Andesitic breccia with carbonate making up the matrix - jigsaw fit of clasts in places - carbonate varies between bande (bedded) and massive
115·45 – 119	Banding 42-60°			White - red diffusely banded limeston (carbonat
119 – 119·90				coherent fd-hbl andesite with xenolith
119·90 – 120·35				white - purple carbonate
120·35 – 123·40				Monomict insitu fd-hbl andesitic brec - carbonate matrix
123·40 – 126·20	magnetic		Ab	coherent fd-hbl±px andesite - hbl to 10mm - fd to 3mm
126·20 – 129·40	Banding in Co 35-50° Ep veins		Ab Ep Co	Monomict breccia (fd-hbl andesite clasts) - carbonate in matrix
129·40 – 139·10 (130)	pyrite bands to 4mm magnetic		Ab Se Py	Coherent - brecciated fd-hbl±px andesite - hbl to 4mm - fd to 3mm - banded carbonate in fractures
139·10 – 142·20 (140)	Bands at 50°			Pink - white carbonate with angular fd-hb andesite clasts - banded carbonate - unbanded carbonate around clasts
142·20 –		230cm		Andesitic breccia with carbonate mat - carbonate wh-red - andesite clasts fd-hbl phyric

LOG

date: | scale 1:200 | HOLE TYN 5

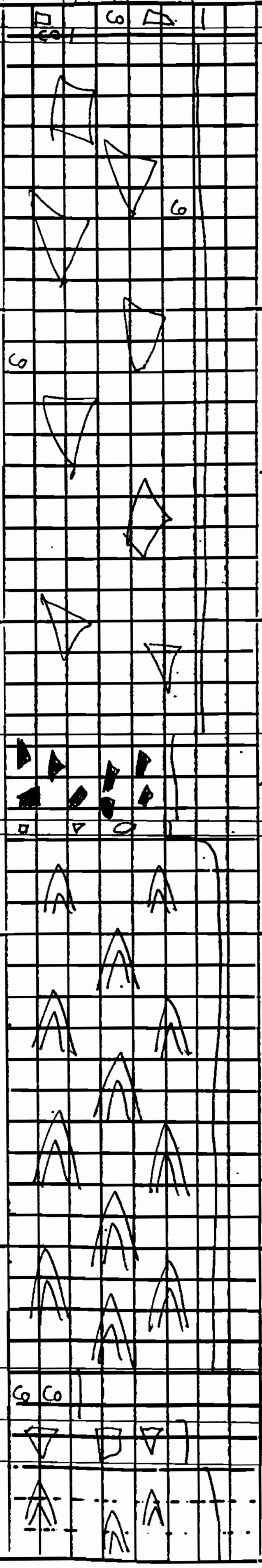
m	structure	ML MP	S	description
150 – 153.1	Co Qtz vein (12cm)			Carbonate matrix / andesite clasts
153.1 – 154.5				Carbonate and andesitic sediments
154.5 – 156.7	pyrite bands		Ab Co Py	Coherent clasts of andesite with carbonate matrix - monomict - andesite fd-hbl-phyric
156.7 – 164	magnetic CoCl vein (50cm)		Ab	Coherent feldspar-hornblende andesite - fd to 3.5mm - hbl to 4mm
164 – 164.6				Monomict andesitic breccia ; carbonate matrix
164.6 – 173.10		>15 cm	Hm Se Cl Ab	Andesitic breccia - strongly altered - fd-hbl in clasts - hbl replaced by Hm - no - carbonate
173.10 – 177.30	non magnetic		Ab	Coherent altered fd-hbl andesite - Fd to 2mm - hbl to 2mm (fine)
177.30 – 200			Hm Co	Monomict andesitic breccia - clasts of fd-hbl andesite - carbonate/hematite in matrix - carbonate altering andesitic groundmass

Depth marks: 150, 160, 170, 180, 190, 200

LOG

HOLE TYN5

date: | grainsize | scale 1:200 | page 5 of

m	structure	grainsize	ML MP	S	description
200					Monomict andesitic breccia
200.80					Pink-white carbonate
201.20			720 cm	Hm Co	Breccia /sandstone - clasts of Hm altered fd-hbl andesite - sandstones of fd-hbl xals - zones of red/white non banded carbonate
210					
220					
223.50			2cm	Ab Hm Co	Polymict breccia (clast-supported) - clasts of fd-hbl andesite and carbonate
226.30					Monomict andesitic breccia
226.70				Ab Se Si	Coherent fd-hbl andesite - porphyritic but not phenocryst-rich - hbl to 4mm - fd to 3mm
230	magnetic				
240					- hbl to 10mm - fd to 3mm
243.85	Banding 52°				White - purple green carbonate
245.1				Si Ep	Monomict fd - hbl andesitic breccia - carbonate matrix
246.7	Bands 30° magnetic				Coherent fd-hbl-phyric andesite
250					

LOG

date: | grainsize | scale 1:200

HOLE TYN 5

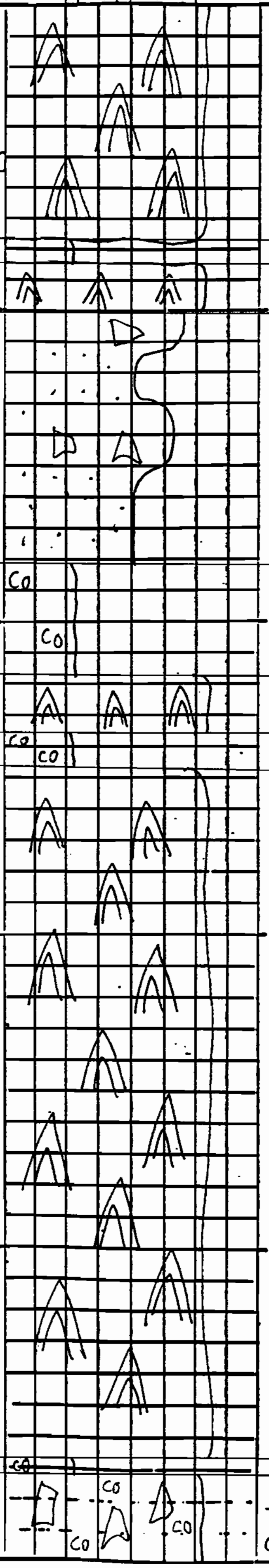
page 6 of 8

m	structure	ML MP	S	description
250			Ep	Fd-hbl-phyric andesite -hbl to 4mm -fd to 3mm
255.1	Bands at 40°			Banded white-red-green carbonate
256.3			Ab Se Cl	Fd-hbl-phyric andesite - feldspars preserved to locally destroyed
260				
260.7	Banding 20°-50°	710 cm		Breccia - lithics of fd-hbl andesite - banded white/grey carbonate
263.35	Bands at 60°			Banded green/white/pink carbonate
264.50		720 cm	Ab Ep	Breccia - fd-hbl andesite lithics - carbonate matrix
266.20	Bands at 40°			Banded carbonate
267.20	Banding 35°	720 cm		Carbonate banded with clasts of fd-hbl-phyric andesite
270	Bands at 60°			Banded carbonate
271.1				Carbonate with andesite clasts
276.1				Green-white carbonate
276.8			Ab Co	Coherent fd-hbl andesite
279.1	25°-30° Bands			carbonate
279.4				
280			Se Cl	Andesite breccia - carbonate matrix - clasts monomict - fd-hbl andesite
286.45				Carbonate with mudstone
287.55		>20 cm	Ab Se Cl	Andesitic breccia - lithics of fd-hbl andesite - carbonate fills matrix
290				
294.30	Bands at 40°		Py	Banded carbonate
295.30			Se Hm	Andesitic sandstone/breccia
296.60			Se Cl	Coherent fd-hbl-phyric andesite - phenocryst poor
300				

LOG

date:	grainsize	scale 1:200	HOLE TYN5

m	structure	ML MP	s	description
300	fault; SiCo Ep vein		Ep Se Cl	Coherent andesite
307.70	Bands 50°			Banded carbonate
308.35			Se Cl	Phenocryst poor fd-hbl andesite
310			Ab Se Hm	Monomict andesitic breccia / sandstone - minor carbonate throughout. - lithics angular
318	Bands at 30°			Banded white-green-red carbonate banding ≡ bedding
320				
321.5			Se Hm Ab	Coherent fd-hbl-phyric andesite - fd to 3mm - hbl to 5mm
323.30				Massive carbonate
324.45	Qtz-Co vein		Se Cl Se Hm Ab	Feldspar-hornblende andesite - appears to be poorly porphyritic but this could be a result of alteration of phenocrysts
330				
340				
346.6				carbonate
347	Banding at 40°	710 cm	Se Hm Ab Co	Monomict breccia - fd-hbl lithics - carbonate matrix
350				



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HOLE TYN 5

date: | grainsize | scale 1:200

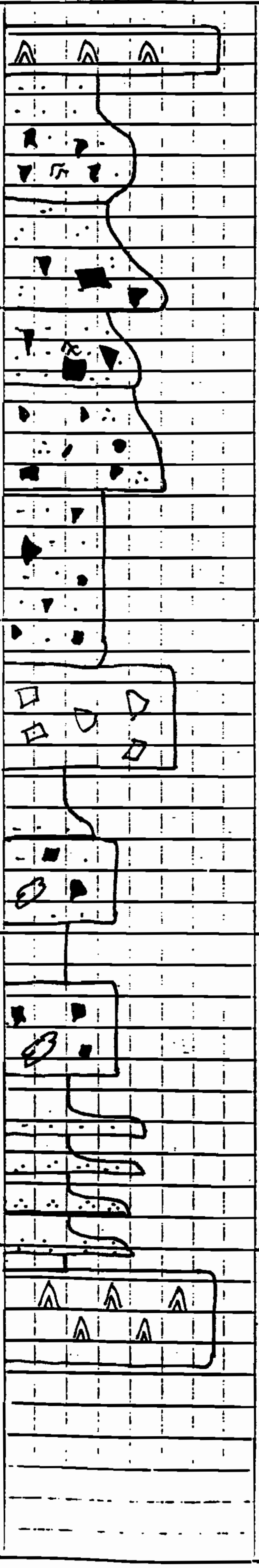
m	structure	ML MP	S	description
350				Andesitic breccia
350.8	Bands at 40°			Banded carbonate
351.7			Hm Ab	Feldspar-hornblende-phyric andesite
354.7	Banding at 40°		Co	Monomict breccia - clasts of fd-hbl andesite - carbonate matrix
356.4	magnetic		Hm Ab Se	Coherent poorly porphyritic fd-hbl-phyric andesite
359.10			Co	Monomict andesitic breccia / limestone matrix
359.70 / 360			Hm Ab	Coherent fd-hbl andesite
361	Banding at 50°		Se	Monomict andesitic breccia - fd-hbl andesite clasts - monomict - banded to massive carbonate forms the matrix
367.55	Bands at 30°			White-red-green carbonate
368.80 / 370			Se Ab Hm Co	Monomict breccia - angular fd-hbl andesite clasts - andesitic sandstone / carbonate matrix
372.70				E.O.H. TYN5 372.70m

LOG Andrew Jones Summary of BLD 89-1

HOLE BLD 89-1

date: | scale none | page 1 of 1

m	alteration	grainsize	ML MP	S	description
7 – 10·5	SeSi				Fd-hbl phyric andesite (coherent- brecciated)
10·5 – 44·5	SeSiClAb				Feldspathic sandstone – lithic breccia (lithics of ~~fd-phyric coherent~~, pumice?) andesitic (fd-hbl) component
44·5 – 62					Feldspar bearing sandstone – lithic breccia (polymict; pumice, fd-phyric coherent, fd-hbl andesite)
62 – 66					Dacitic -andesitic derived sandstone – polymict breccia (lithics of pumice, andesite (fd-hbl))
66 – 96					Feldspathic sandstone breccia (lithics of pumice; flow banded dacite; fd porphyritic dacite)
96 – 145·4					Feldspathic polymict lithic-rich sandstone (lithics of feld-phyric coherent; silicified aphyric)
145·4 – 172·10					monomict (fd-porphyritic lithics) breccia
172·10 – 177·5					Black shale (massive) – grey siltstone
177·5 – 186					Polymict conglomerate/breccia (lithics of siltstone, fd phyric coherent)
186 – 190					Black -grey shales (massive)
190 – 197·2					lithic sandstone (lithics of shale/siltstone and fd-phyric dacite)
197·2 – 200·2					grey/black shale – fd xal sandstone (laminated)
200·2 – 204·2					Black laminated shale – fd xal sandstone (xal rich)
204·2 – 212					Black shale (laminated) – fd ~~xal~~ sandstone
212 – 215·7					Black shale – fd-qtz xal sst (qtz v.minor)
215·7 – 216·1					Black shale
216·1 – 235	SeCl				Fd-hbl porphyritic coherent



LOG Andrew Jones — Summary of BLD 89-2

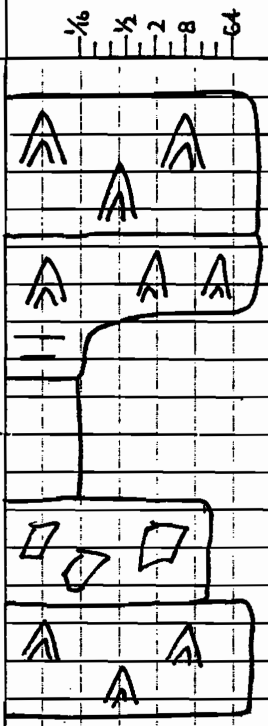
HOLE BLD 89-2

date:

scale: none

page 1 of 1

m	alteration	grainsize	ML MP	s	description
49.7	SiPyCo Se				Feldspar-hornblende phyric coherent andesite
200					contact (intrusive) between fd-hbl andesite and black laminated shales
212	Py				Black/grey shales
229	SeSi				Monomict breccia (fd-hbl andesite lithics)
232					Coherent fd-hbl phyric Andesite
250					



LOG Andrew Jones

Summary of BLD 89-3

HOLE BLD 89-3

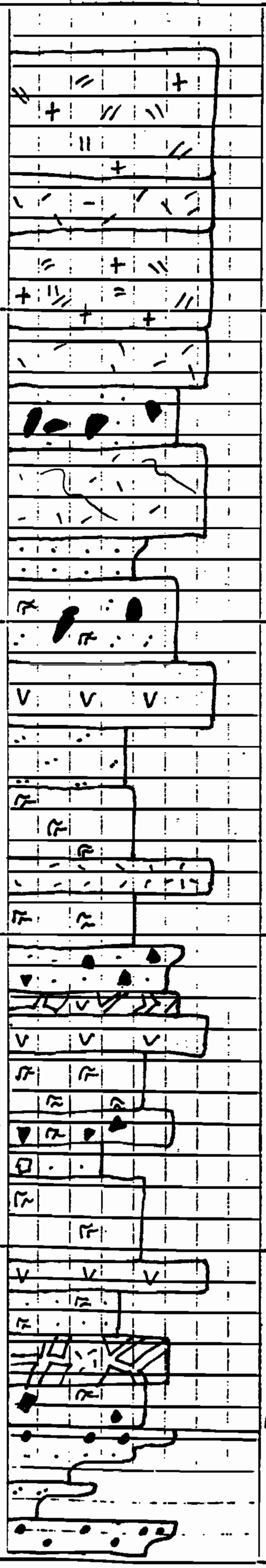
date:

scale none

page 1 of 1

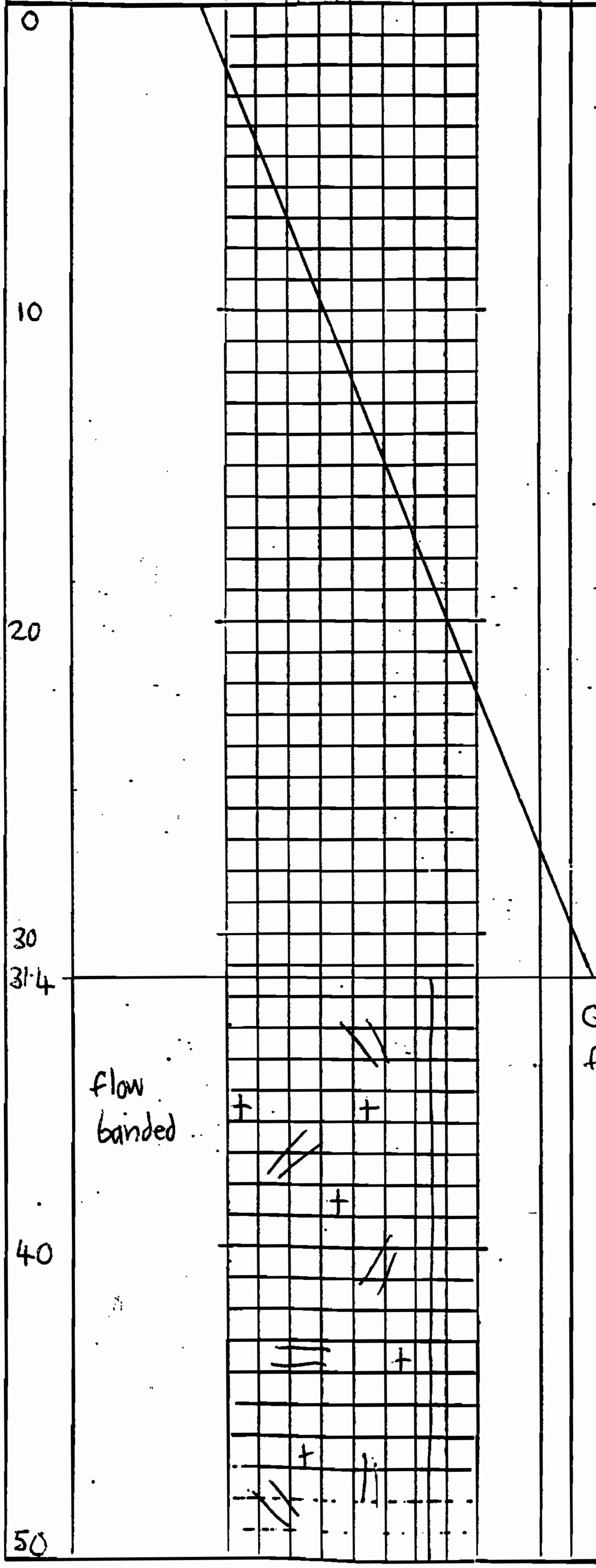
m	alteration	ML MP	S	description
31.4	ClSeSiK			Flow foliated quartz-feldspar porphyry (quartz rounded to ellipsoidal; to 5mm) fractured
100	SeSiClPyK			
160.15	SeClKSiPy			Aphyric flow foliated rhyolite/dacite (chill margin ?)
167.7	SeSiPy			Coarsely porphyritic quartz-feldspar flow foliated rhyolite (quartz to 7mm)
197.25	SePySi			Flow foliated aphyric rhyolite/dacite (could represent a chilled zone ?)
231.6	SeCl			Polymict breccia (lithics of qtz-feld porphyry and aphyric rhyolite/dacite)
239.4	SeCl			SeCl altered probable qtz-feld rhyolite/breccia with distinct chlorite spotting after feldspars?
250.10	AbCl			Feld-qtz sandstone
252.20	AbClSi			Feldspathic pumice + lithic breccia (lithics of fd xal sandstone + fd phyric pumice)
256.9	HmAbCl			Feldspar-pyroxene phyric basaltic andesite
262.3	AbCl			Feldspar xal sandstone
265.2	SiSeClPy			Feldspar-phyric pumiceous sandstone/breccia (feldspars to 3-4mm; pumice clasts 1-6cm)
276	SiSePy			Qtz-fd phyric rhyolite lava? (chilled margins)
278	KClSi			Pumice sandstone/breccia (feld-phyric)
283.55	HmAbCl			Polylithic breccia (lithics of fd-qtz rhyolite, fd phyric rhyolite, pp fd-phyric dacite)
287.5				insitu breccia (fd-Px basaltic andesite)
288.5				coherent fd-px basaltic andesite
296.3	ClKSi			Feldspar-phyric pumiceous sandstone/breccia
304.5				Polymict breccia (orange rhyolite, fd-phyric pumice)
306.3				Fd-px sandstone with lithic of flowbanded qtz-fd rhyolite
308.15	SeSiClK			Feld-phyric pumice breccia
322.95	ClSe			Feldspar-pyroxene basaltic andesite dyke
327.3	ClSiSeK			Feldspathic sandstone/breccia (pumiceous)
344.6	KSi			Brecciated (jigsaw fit) fd-qtz rhyolite
349.9	ClSeSiK			Polymict sandstone/breccia (fd-phyric pumice; coherent)
360.16		FAULT		Pebble conglomerate - qtz sandstone - black mudstone
365.8				
384.3				Qtz sandstone - black mudstone
388.4				Pebble conglomerates

grainsize



LOG Andrew Jones	CODES	HOLE BLD 89-3
date: 30/3/95	grainsize / scale 1:200	

m	structure	grainsize	ML MP	s	description	page 1 of 8
0 → 31.4					no core recovered 0 → 31·4m	
31.4 → 50	flow banded				Quartz-feldspar-porphyritic flow banded rhyolite (Quartz-feldspar rhyolite association of the Anthony Road Andesite) - rounded to embayed quartz phenocrysts throughout (to 4mm)	

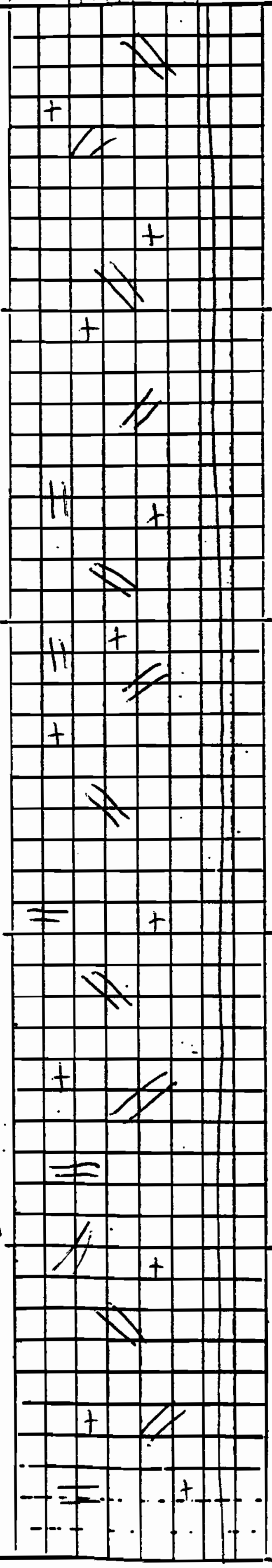


LOG

HOLE BLD89

date: | grainsize | scale 1:200 | page 2 of

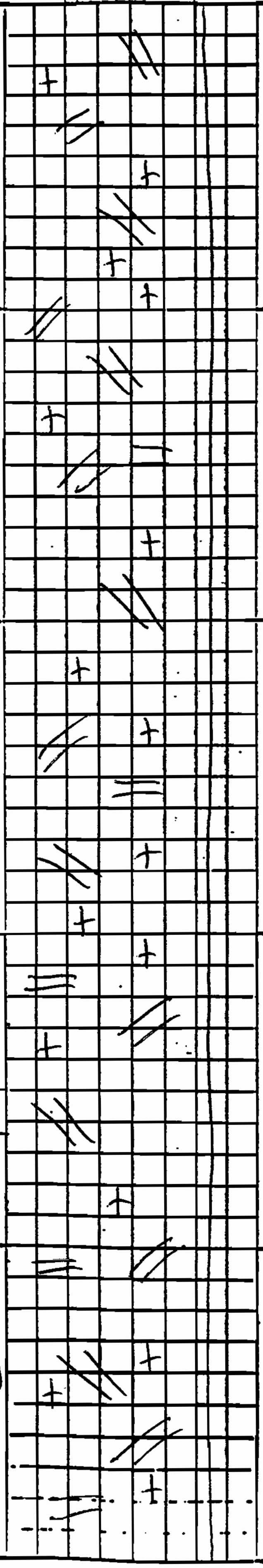
m	structure	grainsize	ML MP	S	description
50	core all clays				Massive quartz-feldspar-phyric rhyolite - rounded quartz phenocrysts to 5mm - qtz displays internal fracture
60					
70	core highly broken				
80				Cl Se Si K	-altered qtz-feldspar rhyolite - green/grey to orange colour - pyrite bands < 5mm and disseminated pyrite - qtz phenocrysts are abundant to 6mm
90	flow banding 45-50°				
	magnetic			Py	- feldspar phenocrysts are altered - chlorite is strung out along flowbanding and is magnetic
100					



LOG

date: | grainsize | scale 1:200

m	structure	grainsize	ML MP	S	description
100	Qtz veins (< 1cm)				Massive qtz-feld-porphyritic rhyolite
				Se Py Si Cl	- flow banding well developed - zones of finer grained phenocrysts throughout - rounded and fractured quartz phenocrysts up to 7mm - feldspar phenocrysts to 4mm - feldspar commonly replaced - Albite and Si Se Py Cl alteration of varying intensities
	Flow banding 40-45°				
110					
				Se Si Ab Py	
120					
	Co Qtz vein Flow banding 30°				
130				Se Si Cl Py Ab	
	Faulted				
					- quartz phenocrysts evenly distributed, rounded with an internal fracture pattern.
140					
	Flow banding 35°				
150					



LOG

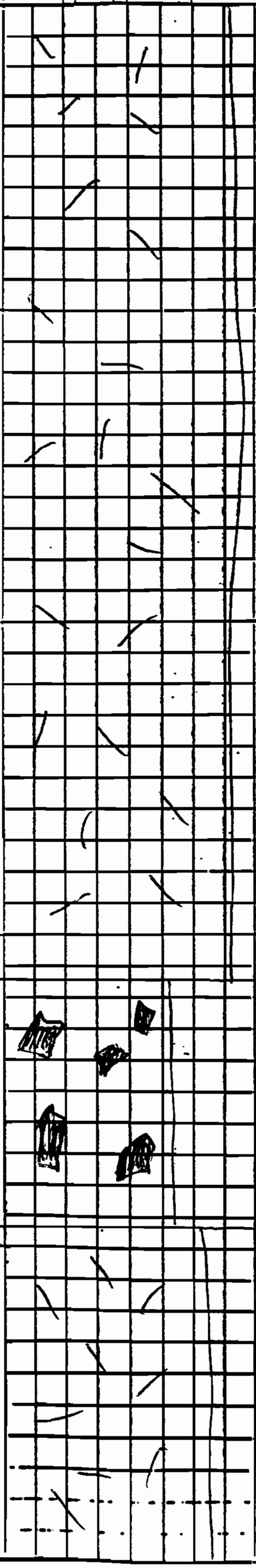
HOLE BLD89

date: | grainsize | scale 1:200 | page 4 of

m	structure	ML MP	S	description
150–160	Qtz Co Cl veins (15-20cm) Flow banding 30-35°		Cl Se Si Py K	Massive qtz-fd-porphyritic rhyolite - flow banded - quartz phenocryst rounded - embayed (to 9mm) - pyrite disseminated
160.15–167.7	Flow banding 30° non magnetic		Se Cl Ab Si Py	Finely qtz-feld-phyric rhyolite - seems to be gradational from porphyry above to this finer unit - possible chilled zone
167.7–197.25 (170, 180, 190)	Qtz Co veins Flow banding at 40° non magnetic qtz Co veins Flow banding 40° qtz Co veins		Si Se Py Se Si Py	Massive qtz-feld-porphyritic rhyolit[e] - flow banded - coarse quartz & feldspar phenocrysts - qtz rounded to ellipsoidal wit[h] a common internal fracture pattern - qtz to 7mm - phenocryst rich (~25% by v[ol]) - gradational into fine rhyolite above and below
197.25–200	Flow banding at 40°		Se Py Si	Flow banded aphyric rhyolite - gradational change

LOG

date:	grainsize	scale 1:200	HOLE BLD89-3



m	structure	ML MP	S	description
200	flow banded at 30° non magnetic		Se Si Py	Flowbanded rhyolite - occassional qtz phenocrysts - dominantly non-porphyritic - pyrite bands and veinlets throughout - chilled margin to coarser rhyolite.
210	flow banded at 40°		Se	
220	flow banded at 30° non magnetic		Se Si	
230	flow banded at 30°			
231·6	cleavage at 25° cleavage at 20°	7cm	Se Cl Se Cl	Polymict breccia - angular/ragged clasts of qtz-feld-porphyritic rhyolite & aphyric flow banded rhyolite.
239·4				
240	non magnetic flow banded			Aphyric - poorly qtz-phyric rhyolite - strongly SeCl altered - occasional quartz phenocryst (rounded)
250				

LOG

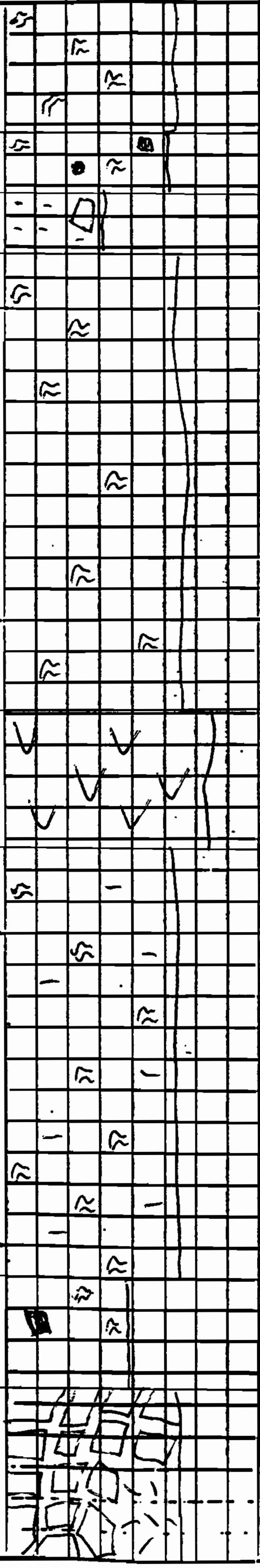
HOLE BLD89

date: | grainsize | scale 1:200 | page 6 of

m	structure	ML MP	S	description
250 – 250.15				aphyric
250.15 – 252.2			Ab Cl	Dacitic sandstone – feldspar xals + qtz
252.2 – 256.9	weakly magnetic		Ab Cl Si	Sandstone / polymict breccia – feldspar crystal ± qtz matrix + clasts of fd-phyric pumice and fd-crystal sandstone
256.9 – 262.3	magnetic		Hm Ab Cl	Feldspar-pyroxene-phyric basaltic ande – lots of pyroxene – feldspar to 2mm – no hornblende
262.3 – 265.2	non magnetic		Ab Cl	Feldspar-crystal-rich sandstone
265.2 – 276	non magnetic		Se Si Cl Py	Pumiceous sandstone / breccia – feldspar euhedral to 3-4mm – packed with flattened pumice
276 – 278	magnetic		Si Cl Se	Qtz-Fd rhyolite lava – phenocryst-rich – chilled margins
278 – 283.55	non magnetic		K Cl Si	Pumiceous sandstone – feldspathic – pumice flattened and altered
283.55 – 287.5	weakly magnetic	7.5 cm		Polymict breccia – angular clasts of qtz-fd rhyolite and purple dacite – clast-supported
287.5 – 290	magnetic			insitu brecciated and coherent fd-px basaltic andesite (fd-px basaltic andesite association of the ARA)
290 – 291.5				Basaltic andesite mixed with fd-xal sandstone – peperitic contacts
291.5 – 296.3	magnetic		Hm Ab Cl	Fd-px-phyric basaltic andesite – altered chilled margins
296.3 – 300			Cl K Si	Pumiceous sandstone – ragged clasts of fd-phyric pumice – euhedral feldspar 2-3mm

LOG

date:	grainsize	scale 1:200	HOLE BLD 89-3
			page 7 of 8



m	structure	ML MP	S	description
300				Pumiceous sandstone / breccia - clasts of ragged pumice (Fd-phyric)
304.5		2cm		Sandstone / breccia - orange rhyolite clasts in pumiceous sandst
306.3		75 cm	Cl Hm	Fd - px ? xal siltstone - flowbanded Fd - qtz rhyolite clast
308.15 – 310 – 320	weak - non magnetic	7cm	Se Si Cl Ab	Pumice breccia - feldspar - phyric pumice - ragged clasts 2 – 7cm with euhedral feldspar to 2mm
322.95	magnetic		Cl Se	intrusive Fd - px - phyric vesiculated basaltic dyke - vesicles Cl or co filled - euhedral feldspar to 3mm Intrusive
327.3 – 330 – 340	non magnetic		Cl Si Se Ab	feldspar xal sandstone / pumice breccia - packed with flattened clasts of Fd-phyric pumice - strongly altered
341		8cm		Still pumiceous sandstone / breccia - contains clasts of orange rhyolite
344.6 – 350		6cm	Ab Si	Insitu brecciated non(poorly) qtz-feldspar -phyric rhyolite - clasts angular and define a jigsaw fit texture - phenocrysts < 2mm

LOG

date: | grainsize | scale 1:200 | HOLE BLD89-

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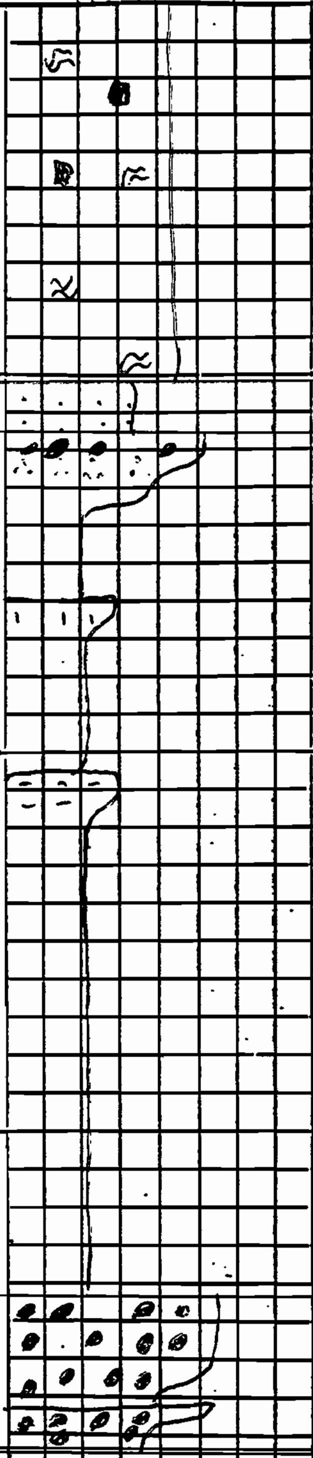
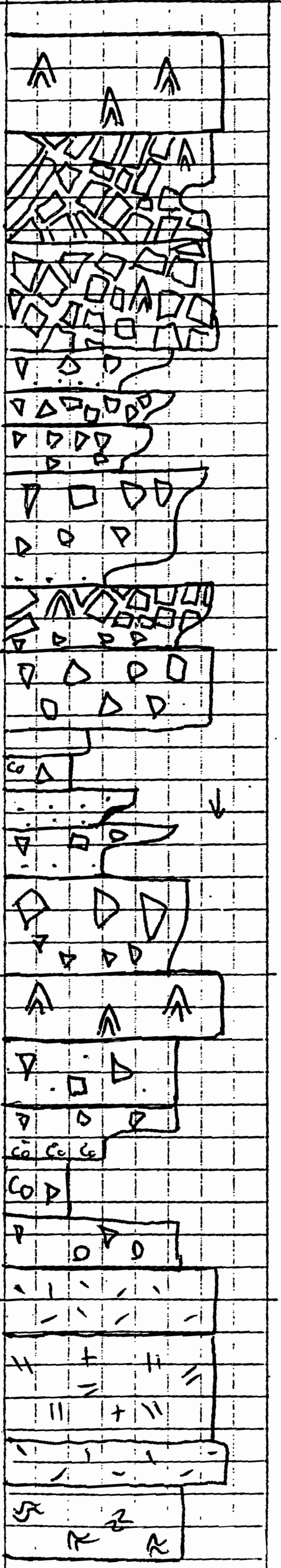


m	structure	ML MP	S	description
350	non magnetic		Cl Se Si Ab	Feldspar xal-rich pumiceous sandston -lithics of rhyolite and ragged fd-phyric pumice - euhedral feldspar crystals to 2mm (Tyndall Group)
360 360.16	Fault			Silicified sandstone ↑Tyndall ↓Owen
361.4	laminae at 40°	3cm		Pebble conglomerate/siltstone/black muds -pebbly clasts well rounded -clasts of quartzite
365.8	40°			Qtz sandstone/ black laminated mudsto
370	core broken		Si Hm	Quartz siltstone /black laminated mudstoni
	laminae 30°			(Owen Conglomerate) -Younging downhole -preCambrian derived -siliceous and hematitic
380	laminae at 40°			
384		5cm		Pebbly conglomerates/sandstones -well rounded quartzite/chert/siltstone clasts -clast supported
388.4				E.O.H. BLD 89-3 388.40m

LOG A.Jones CODES Summary of BL1 (Core at RSC Q'town)

HOLE BL1

date: | grainsize | scale no scale | page 1 of 1



m	Alteration	ML MP	S	description
28.6	Se SeSi			Coherent ? feldspar - hornblende phyric andesite (non magnetic)
100.3	Se Si Se EpSi			Non magnetic feld-hbl andesite insitu monomict breccia (hbl altered)
125.60	SeEp Se			Magnetic feld-hbl insitu breccia (hbl visible)
161.60	Se Co			Monomict fd-hbl andesite breccia - sandstone (some carbonate)
162.75				Andesitic breccia
164.6	Se Co			Andesitic coarse breccia (non magnetic)
167.5	EpSe SeCoSi			Fd-hbl andesitic breccia to sandstone (carbonate and silica in matrix)
182.3	SeEp Se SeCo			Insitu monomict (fd-hbl) breccia (not magnetic)
191	SeCo			Fd-hbl andesitic breccia with fine grained matrix
204.35				grey mudstone/siltstone
204.7	Se Co			White carbonate with andesite lithics
207.9	SeCo			Andesitic/carbonate graded sandstone
208.3	SeEpCo			Andesite lithics with carbonate matrix - andesitic sandstone
212.9	SeEpCo			Monomict (fd-hbl andesite) breccia (coarse - fine)
224.15	SeEp			Coherent fd-hbl phyric magnetic andesite
236	CoEpSe			Andesitic breccia with sand grade matrix
261.8	SeCoEp SeAbCo			Andesitic breccia to siltstone / banded carbonate interbedded
273.1	SeCo HmCoSe			Banded white/pink/orange/green carbonate with andesite lithics
280.5	Jasper, HmCoSe			Highly altered andesite unit (carbonate - hematite banding developed) (some jasper) (magnetic)
296.75	SiSePy			Poorly porphyritic fd-qtz altered/cleaved rhyolite (chilled margin of porphyry)
329.5	Se SeAbCl SiSePy			Coarsely qtz-feld phyric flow foliated/cleaved rhyolite porphyry (non magnetic) (quartz to 9mm) (some breccia zones?)
447.8	SiSePy			Poorly porphyritic rhyolite (chilled margin of quartz feldspar porphyry?)
469.05	AbClSeSi			Variably altered pumice breccia
484				

EOH 484m

LOG Andrew Jones | Core at RGC Queenstown | HOLE BL1

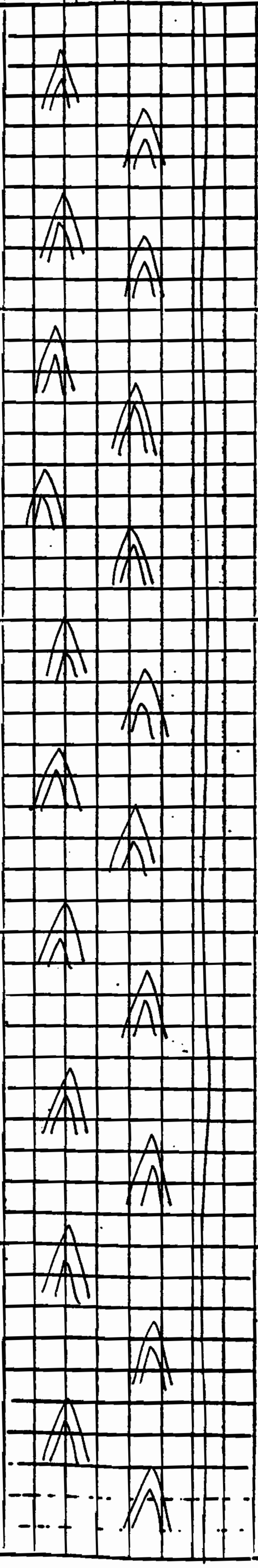
date: 8-9/5/95 | grainsize | scale 1:200

m	structure	grainsize	ML MP	s	description	page 1 o
0					Glacials 0m → 28·60m	
10						
20						
28·6						
30	core very broken to 88m			Se	Feldspar - hornblende coherent / breccia	
				Se	- feldspar preserved (euhedral). Evenly porphyritic (some twinned	
40	non magnetic			Se	- hornblende rarely preserved (altered to sericite) but a few euhedral phenocrysts remain. Maximum size 13mm but average 6-7mm.	
				Se	(feldspar-hornblende andesite/dacite association of the Anthony Road Andesite)	
50						

LOG

date:	grainsize	scale 1:200	HOLE BL 1

m	structure	grainsize	ML MP	S	description
50				Se	coherent feldspar-hornblende andesite - hornblende destroyed though locally preserved
				Se Si	- feldspar generally preserved - lots of fine grained sericite in groundmass.
60					
	non magnetic			Se Si	
70					
				Se Si	
80					
	cleavage at 40° to core axis			Se Si	coherent
90					
				Se Si	
100					

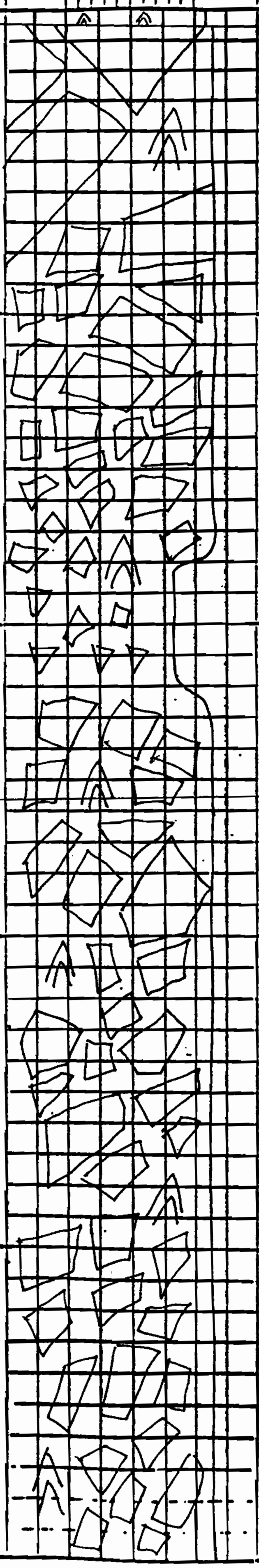


LOG

HOLE BL1

date: | grainsize | scale 1:200

m	structure	grainsize	ML MP	s	description
100 100.3	↓ non magnetic				Breccıated fd-hbl andesite (largely insitu)
					-hbl altered
				Se Si	-fd generally preserved (several areas could be coherent
			largest >20cm		-little matrix material
					-monomict
110	magnetic			Se Ep Si	
					Angular andesitic clasts. Rotation of clasts has occurred.
120					- Epidote in matrix
					-monomict
				Se Ep	
125.60	magnetic				hbl is visible (to 9mm)
					Fd-hbl insitu breccia
130			>25 cm		(large clasts and some areas could be coherent?)
	variably magnetic			Ep Se	
140				Se	hbl to 5mm
	core very broken → 161.60m				
				Se	hbl sericite altered
150					



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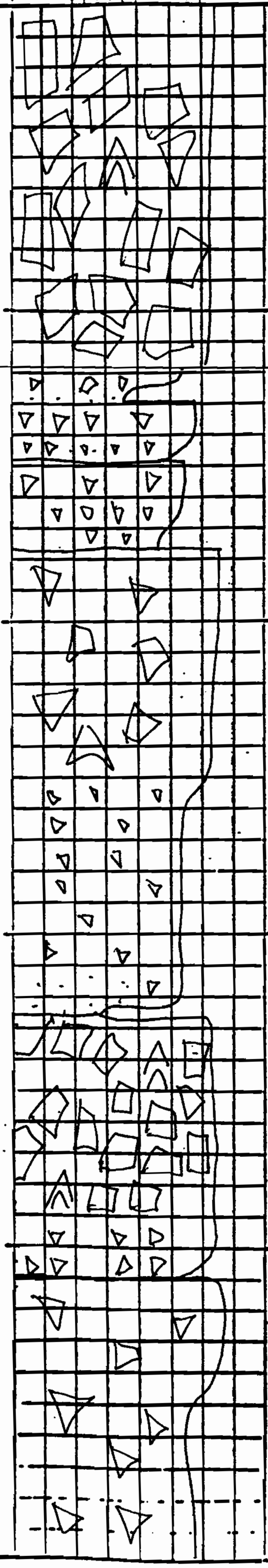
LOG

HOLE BL1

date: | grainsize | scale 1:200 | page 4 of 1(



m	structure	ML MP	S	description
150				
			Se	Insitu fd-hbl andesitic breccia (hbl altered) – not always strictly insitu – monomict and jigsaw fit
160				
161.6				
162.75	not magnetic	5cm	Se	Andesite becomes fresher, lose jigsaw fit – clast supported bases/sandstone tops
		6.5cm	Co	– carbonate first appears
164.6				
				All monomict fd-hbl andesitic
167.5				
			Ep Se	Fd-hbl andesite breccia – lithics 25cm → 1-2cm → siltstone top
170				andesite very fresh – hbl to 10mm; feldspar to 3mm
				– strictly monomict
				– carbonate or silica commonly in matrix
175			Se Co Si	
180				
182			Se	
182.3			Ep	Apparently insitu andesite breccia – lithics average >10cm (fresh) – monomict
		>10cm	Se	
189.20				not insitu (clast supported – fine grained andesitic matrix
190	not magnetic		Se	
191				
		>10cm		Not insitu monomict fd-hbl andesitic breccia
194.4		2-40 cm	Se	
			Co	andesitic breccia – altered f.g. matrix – lithics fresh – hbl to 8mm
200			Se Co	

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HOLE BL1

date: | grainsize | scale 1:200

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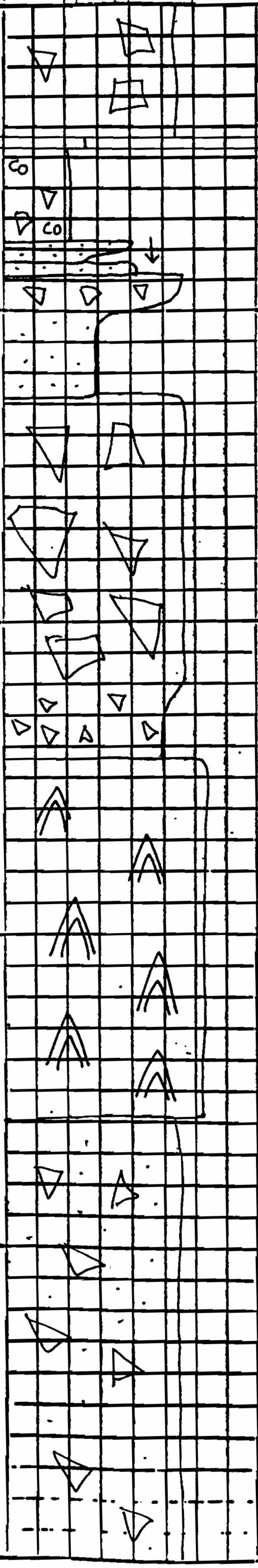

m	structure	ML MP	S	description
200		2-6 cm	Se Co	Monomict fd-hbl andesitic breccia -lithics angular - hbl to 15mm
204.35				grey mudstone/siltstone (volcanic)
204.70		17cm	Se	White carbonate with andesitic lithics
207.9	foliated at 47°		Co	Transition from coarse breccias – sst /c - andesitic/carbonate graded sandstone (younging downhole)
208.3				Breccia with angular andesite lithics (carbonate and andesitic matrix)
210	cleavage 30°			Andesitic siltstone (feldspar/hornblende crystal
212.90		>10cm	Se Co	Coarse fd-hbl andesitic breccia (lithics 4-6cm)(a few >10cm) monomict - lithic supported
220				
	variably magnetic	4cm 1-5cm	Ep Se Co	Finer breccia -lithics <1cm is matrix supported
224.15			Se Ep	Coherent fd-hbl-phyric andesite - lava flow -hbl to 9mm - Fd to 4mm -very epidote altered
230	magnetic		Ep Se Co	
236		2-3cm	Co Ep Se	Fd-hbl andesite breccia - breccia → sandstone package - matrix of breccia is sericitised (sand → silt grade) - lithics all andesitic but some sericite altered/some albite altered, some replaced by hematite
240	foliation 45°			
			Se Ep	
	cleavage 47°			
250				

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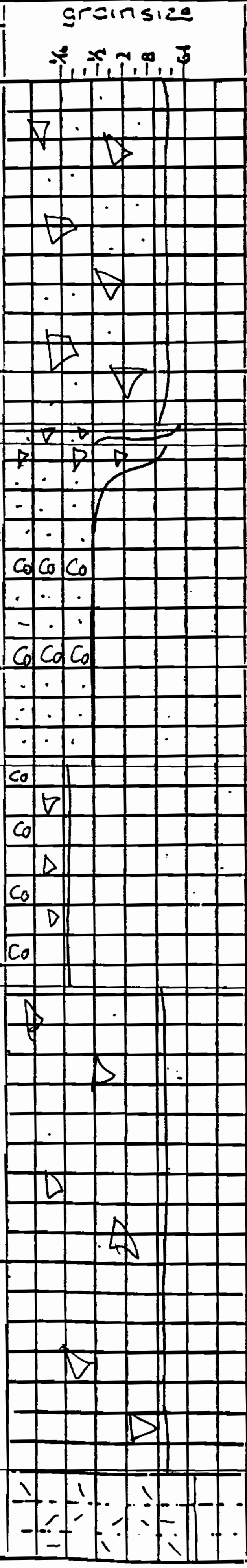
date: | grainsize | scale 1:200 | HOLE BL1



m	structure	ML MP	S	description
250 – 261.8	cleavage 43° not magnetic		Se Ep Se Co Ep Se	Andesitic breccia, sandstone – siltstone package - all andesitic
261.8		4.5cm	Ab	Andesitic breccia – siltstone (younging ↓)
262.6 – 273.1	banding 34° not magnetic banding 40° banding 40°	5.5cm	Co Se Co Se Ep Co	Andesitic breccia grades into siltstone - banded carbonate zones throughout siltstone (largest carbonate zone 12cm) - fd/hbl. crystals in siltstone - siltstones and carbonate are bedded
273.1 – 280.50	banding 34° banding 50° banding 33° banding 20° magnetic		Hm Co Se	Banded white/pink/orange/green carbonate with fd-hbl andesitic breccia zones in carbonate - largest breccia zone is 65cm Andesite is AbHmCo altered
280.50 – 296.75	banding 30° magnetic banding 30° banding 30°	8cm	Ja Hm Se Co Hm Co Hm Se	Highly altered andesitic breccia/sandstone - alteration is jasper/hm/carbonate - segregated banding developed Co/Hm / Co/Hm Banding accentuated during deformation
296.75 – 300	foliation 28°		Si Se Py	Poorly porphyritic Qtz-fd-rhyolite (chilled margin (grey - palegrey) - flow foliated

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HOLE BL1

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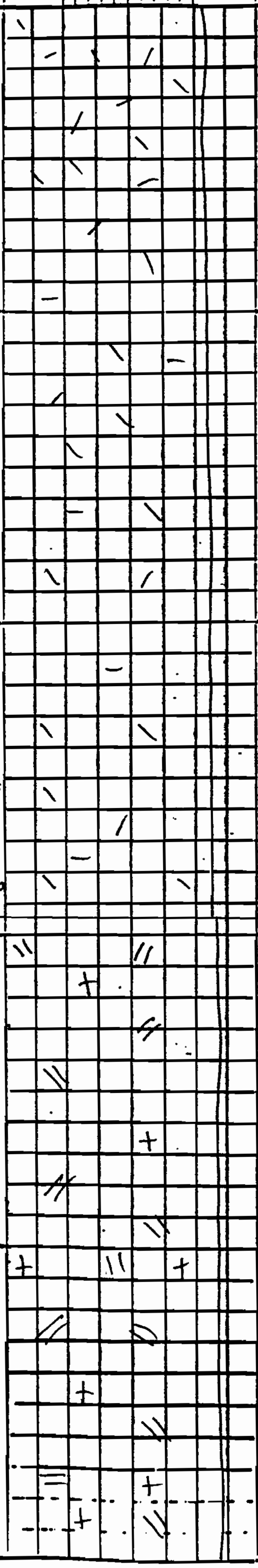
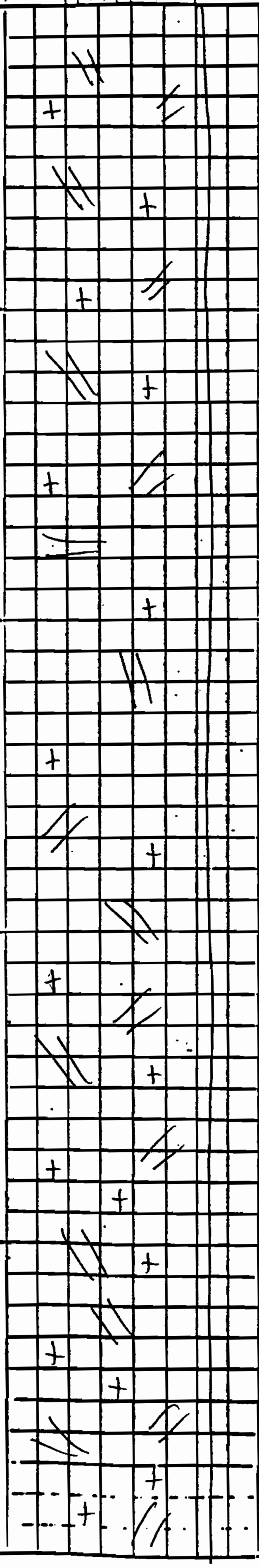
m	structure	grainsize	ML MP	S	description
300	banding 30°			Si Se Py	Qtz phenocrysts and some feldspar preserved
					-fd commonly sericitised to an orange col
					disseminated pyrite 298-304m intense
	flow banding 28°				- some minor brecciated zones
310	foliation 20°			Si Se Py	- only very weakly magnetic -overall not magnetic (quite intense alteration)
	foliation 28°				-more qtz phenocrysts
320					
	foliation at 10°			Si Se Py	- largest quartz phenocrysts 5mm (rounded and resorbed)
	foliation at 20°				
329.50					
330	foliation 28°			Se	Coarsely qtz-feldspar-phyric rhyolite
					-quartz phenocrysts rounded/embayed
				Se	-feldspars pink in SeAbCl areas and commonly destroyed in SiSePy areas
340	foliation 30°				-qtz phenocrysts to 9mm with smaller ones 1-2 mm (commonly have a fractured texture
	non magnetic			Se	-qtz sometimes elongate with foliation
	foliation 20°			Ab Se Cl	
350					

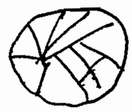
LOG

HOLE BL1

date: | grainsize | scale 1:200

m	structure	grainsize	ML MP	S	description
350	qtz-Co-Cl veins (10cm x 2cm) non magnetic			Se Ab Cl Si	Qtz-feldspar porphyritic rhyolite (qtz-fd rhyolite association of the Anthony Road Andesite) - alteration is intense in groundmass
360				Si Se	
	banding ~10°			Se Si	- Some areas of finer phenocrysts
370					- qtz embayed and rounded but evenly distributed - qtz commonly 5-7mm with a fractured texture
				Si Se	- feldspars to 4mm in AbCl Se altered areas where they are preserved
380	banding ~20°				
	non magnetic			Si Se Ab	
390	banding ~20°			Si Se Py	
400					





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HOLE BL

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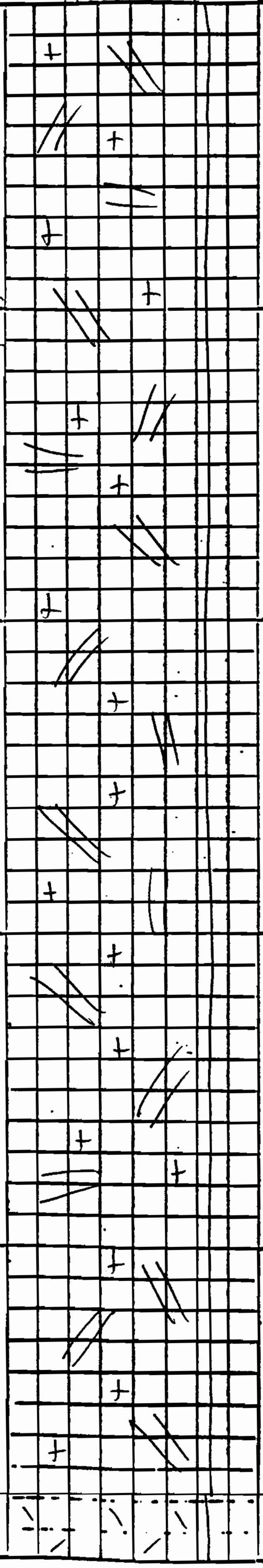
m	structure	grainsize	ML MP	s	description
400	banding < 10° non magnetic			Si Se Py	Qtz - fd porphyritic rhyolite (qtz - fd - rhyolite association of the Anthony Road Andesite)
410	fault			Si Se Py	- dominantly massive coherent flow banded fd - qtz rhyolite
					- disseminated pyrite throughout groundmass
420				Si Se Py	
430	flow banding 15° non magnetic			Si Se Py	coarsely porphyritic qtz - fd rhyolite
440	banding 20° Qtz - Co vein (10cm)			Si Si Si	
447.8					
450	banding 5°			Si Se Py	poorly porphyritic qtz ~~fd~~ rhyolite (chilled margin to porphyritic rhy



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date:	grainsize	scale 1:200	HOLE BL1

m	structure	ML MP	S	description
450	non magnetic banding 10°		Si Se Py Si Se Py	- Some coarse qtz phenocrysts but overall finely porphyritic · pyrite common (chilled margin) - intensely altered groundmass - alteration imparts a pseudobreccia texture
460				
460.50			Si Se	Strong sericite altered. Breccia of rhyolite above
461.80	cleavage 25° (very cleaved) zone cleavage 30°		Se Se Ab Se	Highly altered and very cleaved Pink feldspars (Ab altered) - strongly cleaved - qtz very minor component - sharp contact
469.05				
470	banding very irregular non magnetic		Ab Cl Se Cl Ab Se Si Se Si Cl Ab	Pumice breccia - pumice clasts 1cm – 10cm - dominantly fd-phyric (fd to 2-3mm) - qtz minor (< 1mm) tubular texture preserved in places - minor disseminated pyrite - alteration is variable but includes lots of orange (Ab)/chlorite/sericite with silicification
480				
484				EOH BL1 484m

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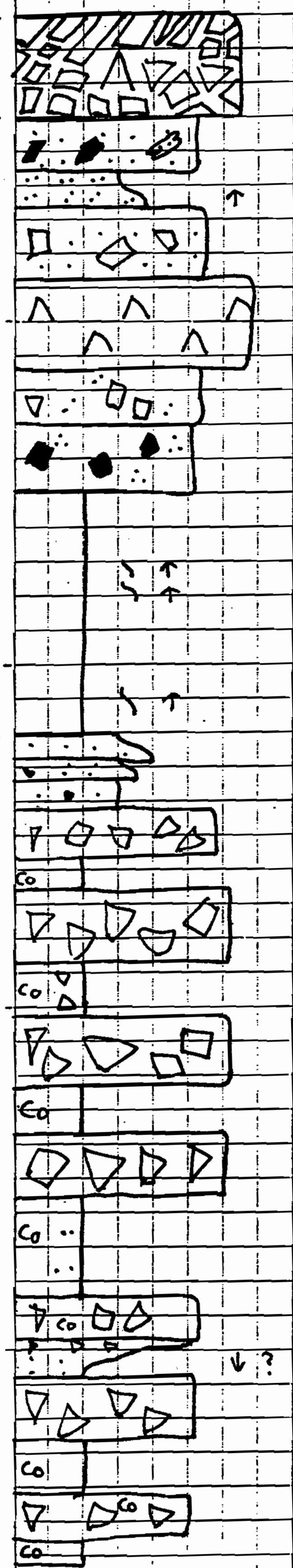
LOG Andrew Jones | CODES | Summary of BL2 | HOLE BL2

date: | grainsize | scale no scale | page 1 of 1



m	Alteration	description
26	SeEpHm	Largely insitu breccia of fd-hbl andesite (jasper on many fractures)(monomict)
78.65	seAb	Polymict breccia (lithics of mudstone/Ab altered fd-hbl andesite/se altered fd-hbl andesite)
87.8		Graded (Younging uphole) andesitic sandstone
88.1		Cleaved monomict (fd-hbl andesitic) breccia (hbl often sericitised)
144	se	Coherent fd-hbl andesite
167	seHm	Monomict fd-hbl andesitic breccia
188.50		Polymict breccia/sandstone (banded carbonate lithics/fd-hbl hm altered lithics)
197.40		Laminated pyritic black mudstone (laminae orientation suggests folding) (Younging uphole)
222.5	SeCoHmAb	f.g. siltstone – sandstone (carbonate in matrix; fd-hbl andesitic)
230.6	SeAb	Monomict fd-hbl andesitic lithic breccia
232.5		Carbonate
232.7	SeClCo	Monomict fd-hbl andesitic breccia (carbonate or andesitic siltstone matrix)
250.8		Carbonate (with fd-hbl lithics)
252.7	CoAbSe	Monomict breccia (fd-hbl andesitic lithics)
263.3		Banded white-purple-green carbonate
264.7	AbHmEp	Monomict fd-hbl andesite lithic breccia
268.1		Carbonate/Andesitic derived siltstone
274	Ab	Monomict andesite breccia (carbonate in matrix)
279.15	AbCo	andesitic breccia to sandstone (Younging downhole?)
279.9	Ab	Monomict fd-hbl andesitic breccia (carbonate matrix)
290.5		Carbonate
291.6	Ab	Monomict breccia (andesitic)(carbonate matrix)
295.6		Carbonate
296		

EOH 296.0m

LOG Andrew Jones Summary of BL3

HOLE BL3

date:

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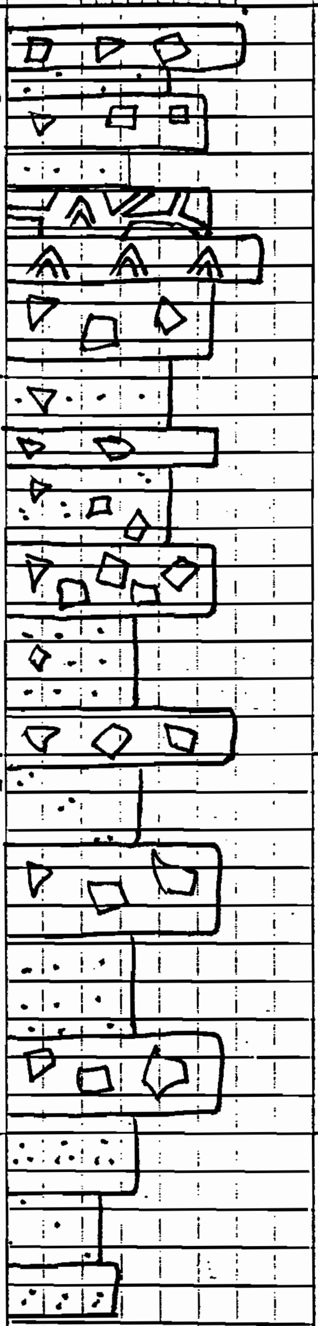

m	alteration	description
55		monomict breccia (fd-hbl phyric lithics)
60	Se Co Hm Ep	andesitic (fd-hbl) derived breccias - sandstones carbonate in matrix
81		insitu brecciated (fd-hbl phyric) andesite
88.7	Hm Na Co Ep	coherent fd-hbl andesite
92		
105	Se Ep Hm Na Co	monomict breccias of fd-hbl phyric andesite (some insitu breccia)
224.7		xal-rich (fd-hbl) sandstone with clasts
246	Se Hm Co Ep Cl	monomict fd-hbl andesitic breccia
252.4		Fd-hbl sandstones to fd-hbl phyric lithic breccia
274.1		monomict fd-hbl andesite lithic breccia
284	Se Ep Na Cl Hm Co	andesitic (fd-hbl) derived sandstone with lithics
307	Se Ep Hm Na Cl	monomict fd-hbl breccia
311		Andesitic sandstones (fd-hbl xal bearing)
318.5		monomict andesitic (fd-hbl) breccia
333		fd-hbl xal bearing andesitic derived sandstone
353		monomict andesitic (fd-hbl) breccia
366		Andesitic (fd-hbl) derived siltstone/sandstone with carbonate-hematite banding
392	Se Cl	massive non xal bearing siltstone
446	Se Co	Andesitic (fd-hbl) derived sandstone/siltstone
451		

LOG Andrew Jones Summary of BL4

HOLE BL4

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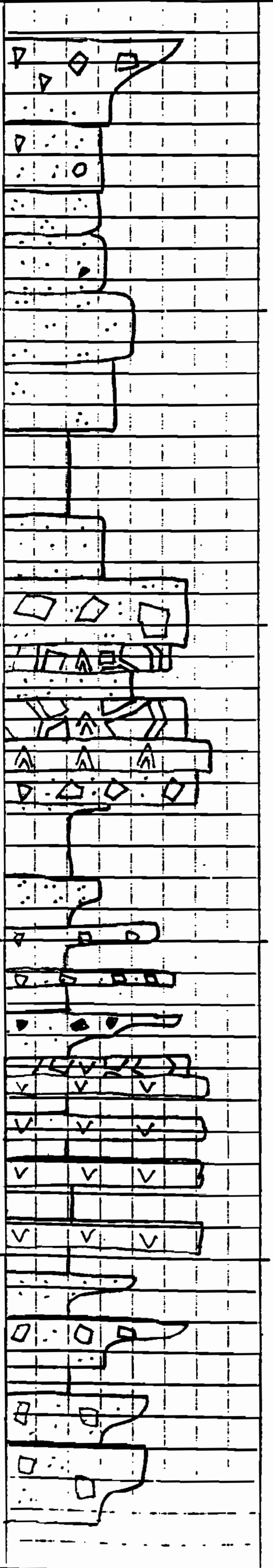

m		ML MP	S	description
9.5	SiPySe			monomict andesitic (fd-hbl) breccia - sandstone
	AbSiClCo			
27	SiSePyAb			Fd xal sandstone with fd-qtz coherent lithics
32.6				fd-hbl xal sandstone
35.7				fd xal sst ; minor lithics
43	PySiSe			fd + mafic (hbl) xal sandstone
60				feldspar sandstone with fd-phyric lithics
68.3				grey mst with feldspar xals (pyrite bands)
	SeEp			
81	ClCoSi			Feldspar xal sandstone
92	Co			monomict breccia; fd-hbl andesite lithics
100.5				moncmict insitu (jigsaw fit) breccia, fd-hbl andesite
102				andesitic sandstone (fd-hbl)
103				insitu fd-hbl andesitic breccia
106.4				coherent fd-hbl phyric andesite
108				monomict fd-hbl andesitic breccia
110.2	Py			Black msts/silsts (6 graded units; laminated)
131.4	SeCoHm			Fd-hbl xal sandstone — black mudstone
134.8				Fd-hbl andesite clasts in breccia - black mudstone
142.8				fd-hbl andesitic breccia
150.2	Py			
171.4	SeCo			Polymict (fd-hbl andesite, qtz-fd coherent) breccia - sst - mudstone
173.8				insitu basaltic andesite breccia
180.5				basaltic andesite (Px-fd)
182				black mudstone
182.5				basaltic andesite (Px-fd)
185.5				black mudstone
186.6				basaltic andesite (Px-fd)
189.2	Py			black mudstone
192.7	SeCo			basaltic andesite (Px-fd)
214.6	Py			black mudstone
220	CoSe			fd-qtz xal sandstone - laminated mudstone
225.60				sequence of monomict breccias (fd-hbl andesite) to fd-hbl xal sandstones
244				Black mudstone (pyrite bands)
246.8	EpSe			andesitic (fd-hbl) lithics and sandstone
266	SeEp + Si			fd-hbl andesite lithic bearing andesitic sandstone
289				

LOG Andrew Jones CODES

Basin Lake 004

HOLE BL4

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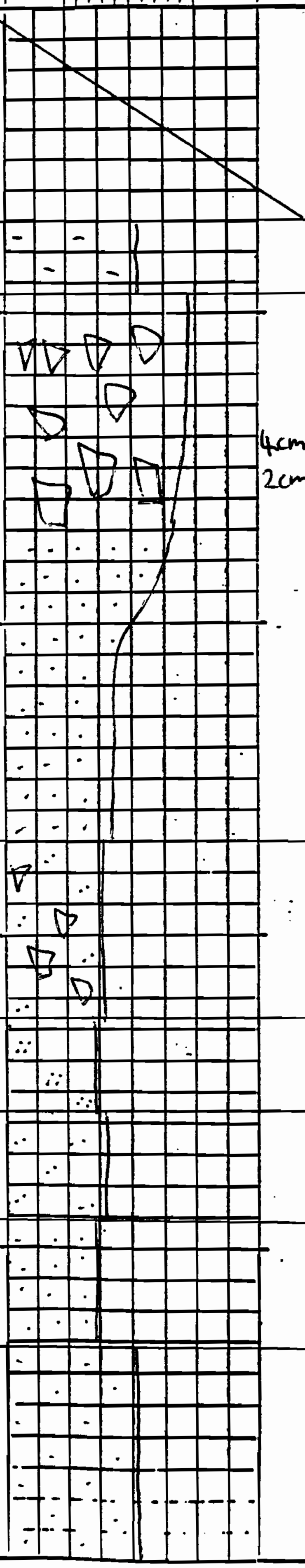

m	structure	ML MP	S	description
0				Glacials Om → 7m
7				Oxidised/weathered feldspathic volcaniclast
9.5, 10, 20	not magnetic	4cm 2cm	Si Py Se; Ab Si Cl Co	Monomict breccia / sandstone - angular/blocky clasts of fd-hbl andesite/dacite - euhedral feldspar to 5mm - almost jigsaw fit texture in places - sandstone contains fd + hbl xals (feldspar - hornblende andesite/dacite association of the Anthony Road Andesite)
27, 30			Se Si Py	Fd sandstone - clasts of pink, angular, fd-qtz-phyric rhyolite
32.6			Si Se Py	Feldspar + hornblende crystal bearing sandstone
35.7			Ab Py Se Cl	Feldspathic sandstone - seClPy altered - minor cleaved sst lithics
39.1, 40	magnetic Py bands		Se Ab	Feldspar + magnetite crystal sandstone
43.2, 50	magnetic		Se Py Si Cl	Feldspar ± ferromagnesian crystal sst - strong SiSePyCl alteration - cleaved strongly with pyrite bands parallel to cleavage

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HOLE BL4

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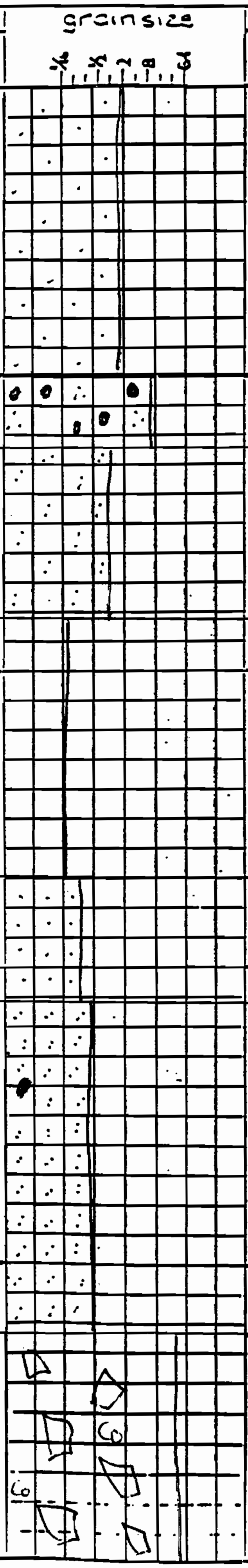

m	structure	ML MP	s	description
50 – 60	non magnetic		Si Se Py	Feldspar ± ferromagnesian sandstone
60 – 62.5			Py Se Cl	Polymict conglomerate -rounded clasts of dacite and sandsto
62.5 – 68.3	core very broken		Si Se Py Cl	Cleaved feldspathic sandstone - lots of pyrite banding
68.3 – 70 – 77.1	non magnetic		Py Se Co	grey mudstone -about 3 m where mudstone replaced by massive pyrite
77.1 – 80 – 81	Co veins		Se Ep	Schistose feldspathic unit - Se Ep altered -cleaved
81 – 90 – 92	Co veins CoQtzCl vein (29cm) magnetic		Cl Co Si Hm	Feldspar xal sandstone -non bedded -altered
92 – 100	magnetic		Co Co	Monomict andesite breccia - angular/blocky clasts of Co-hbl-porphyritic andesite - carbonate fills matrix betwe clasts

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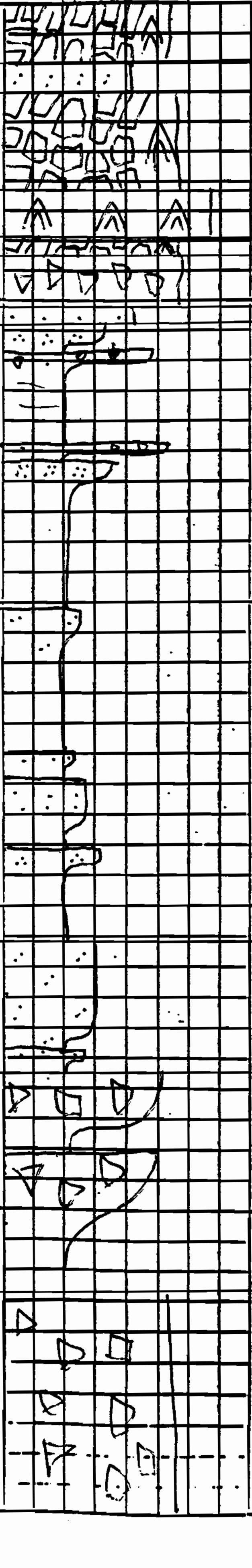
HOLE BL4

date: | grainsize | scale

m	structure	ML MP	s	description
100			Co	Insitu andesitic breccia – clasts define a jigsaw fit
				Sandstone
	Co veins	2cm 6cm	Co	Monomict insitu fd-hbl andesite breccia
				Coherent fd-hbl-porphyrite andesite
				insitu breccia
	weakly magnetic	6cm		Monomict andesitic breccia – fd-hbl-phyric andesite in clasts
110				Fd xal sandstone
	Py bands		Py	Graded feldspar xal sandstone to thinly laminated black mudstones – younging downhole – pyrite bands common
			Py	
120	Py bands		Co C	
	Co veins			
	magnetic		Py	
130	CoQtzEp vein(6cm)			Fd-hbl xal sandstone/siltstone/black mudstone – younging downhole
	magnetic		Se Co	Monomict breccia/~~massive~~ black mudstone – clasts of angular fd-hbl andesite – mudstone thinly laminated in part
140				
	magnetic		Hm Co	Monomict breccia – clasts of angular fd-hbl-phyric andesite – mudstone in matrix – clasts from quench fragmentation
150				



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HOLE BL4

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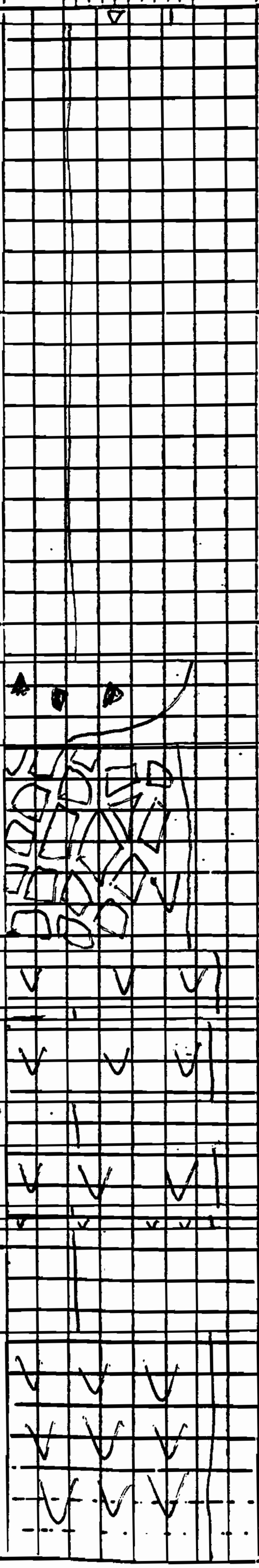

m	structure	ML MP	s	description
150 150·2	weakly magnetic		Py	Massive black mudstone to thinly laminated black mudstone - framboidal pyrite crystals to 1-5cm - pyrite bands throughout (~2mm
160				
170 171·2	intrusive peperitic		Se Co	Polymict breccia to black mudstone - angular clasts of fd-hbl andesite / fd-q rhyolite
	Co veins	3cm 8cm	Se Co	Insitu monomict basaltic andesite breccia - fd-px-phyric (feldspar-pyroxene basaltic andesite association of the Anthony Road Andesite).
180	magnetic			Coherent px-fd-phyric basaltic andesite - chilled margin - peperite
				black mudstone
	Co veins			Coherent Fd-px basaltic andesite - Co fills vesicles - chilled margin (peperitic)
	cleavage 40° to bedding			Black mudstone (disrupted)
	Co veins			Fd-px basaltic andesite - chilled top and base
				mudstone coherent basaltic andesite
190	magnetic Py bands			Black mudstone - laminated (not disrupted) - pyritic
	(3cm) Co qtz vein magnetic		Se Co	Feldspar-pyroxene-phyric basaltic andesite - carbonate filled vesicles - vesicles to 5mm - sparsely porphyritic (~5%)
200				

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date:	grainsize	scale	HOLE BL4
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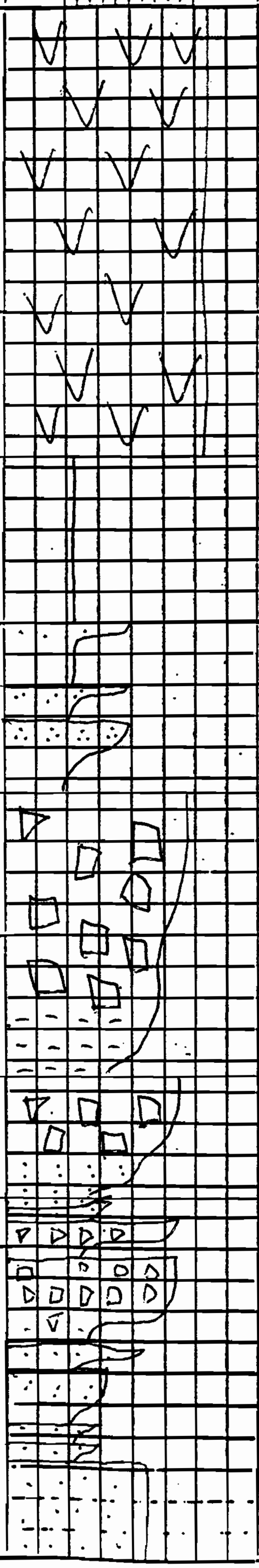

m	structure	ML MP	s	description
200			Se Co	Coherent feldspar-pyroxene-phyric basaltic andesite -phenocrysts < 5% -px < 1mm -slightly vesiculated (chlorite or calcite filled)
210				-chilled margin -extrusive contact
214.6	core broken magnetic		Py	Black/Green laminated mudstone - pyrite banding
220				Qtz-feldspar xtal sandstone with mudstone (laminated) tops - younging downhole
225.6	weakly magnetic	12 cm	Co Si Se	Monomict andesitic breccia/sandstone - angular clasts of fd-hbl-porphyritic andesite - andesitic matrix (fd-hbl andesite/dacite association of the Anthony Road Andesite)
234			Co Se	Monomict andesitic breccia/sandstone - fd-hbl-porphyritic andesite clasts (hbl to 9mm)
238.5				
240	magnetic		Co Se Si Se Ep Co Si	Andesitic graded breccias/sandstones/mudstones - fd-hbl andesite derived - younging downhole
	CoQtz vein (3cm)		Ep Se	Fd crystal ± hbl volcaniclastic sandstone
250				

LOG

HOLE BL4

date:

grainsize

scale

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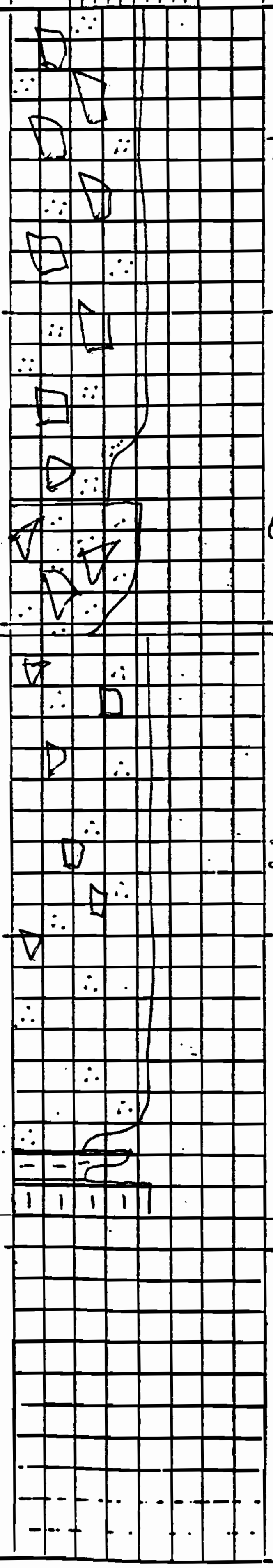
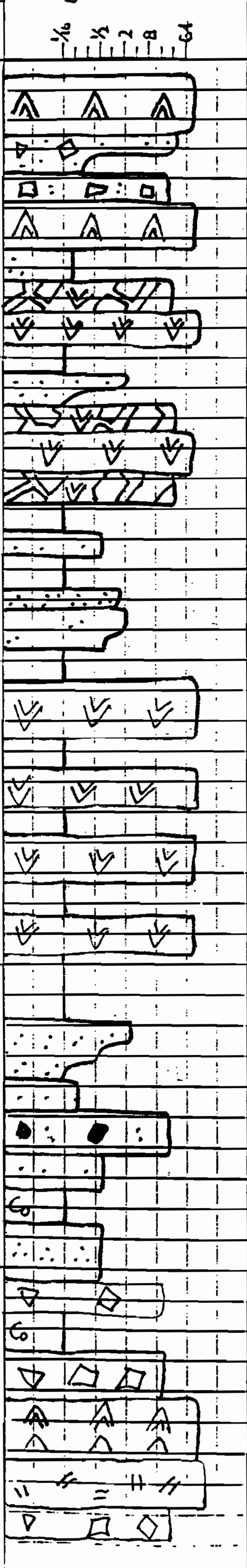
m	structure	grainsize	ML MP	s	description
250	Qtz Co vein (2cm)		7cm	Ep Se	Monomict andesitic breccia/andesitic sandstone/siltstone - clast poop - matrix supported - clasts angular fd-hbl-porphyry - hbl to 9mm - phenocryst rich (~20%)
	Co vein (3mm)			Co	- carbonate in matrix in places - younging downhole
260	weakly magnetic		6-5 cm		
270			3cm	Ep Se	Monomict andesitic breccia/siltstone top - fd-hbl andesite clasts - clasts angular to blocky - fd-hbl xal rich matrix and siltstone - laminated siltstone top - younging downhole
280	weakly magnetic			Se Si	
289					E.O.H. BL4 289.0m



LOG Andrew Jones — Summary of BL5

HOLE BL5

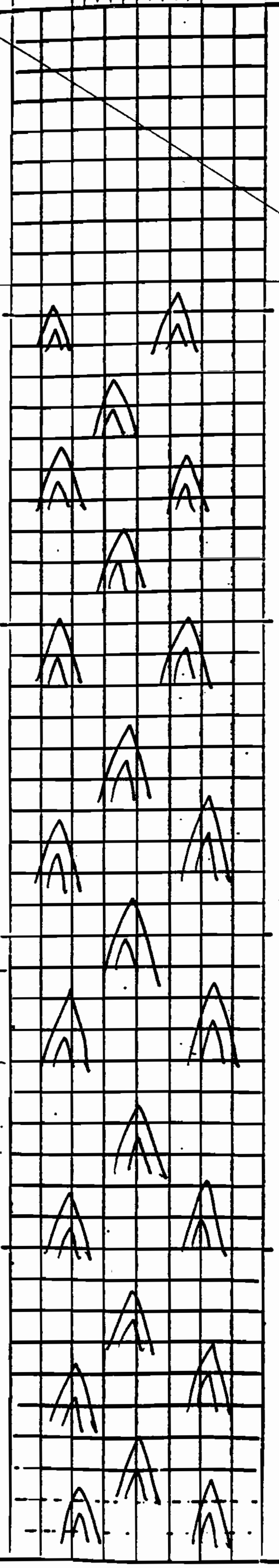
date: — grainsize — scale none — page 1 of 1



m	alteration	ML MP	S	description
9	SeSi ± Py	Faults		Feldspar- hornblende-pyroxene andesite
59.55	SeSi			monomict fd-hbl andesite lithic breccia to andesitic siltstone
63.7				monomict fd-hbl andesite lithic breccia
66				Fd-hbl phyric andesite (flowbanded)
77.5		fault		Silicified siltstone
79				Insitu monomict fd-px basaltic andesite
81				Fd-px coherent basaltic andesite
88				Laminated black shale
89.05	Se			Fd-hbl + (fd-hbl andesite) lithic sst - black mst
90.40	SeCo			monomict insitu fd-px bas andesite breccia
95.70				coherent fd-px basaltic andesite
99.40				Fd-px bas. and. breccia - coherent
107.75				Black shale
108.50				andesitic derived sandstone (fd-hbl-px)
110				Black shale
117.90	SiSe			Dacitic/andesitic derived sandstones (fd-px-qtz - hbl
118.70				
121	Py			massive black shale
123.50	SeCo			monomict breccia - coherent fd-px basaltic andesite
173.95				Black shale
174.40				Brecciated - coherent fd-px basaltic andesite
179.4				Black Shale
179.8				Brecciated - coherent fd-px basaltic andesite
188.7				Black shale
189.05				Fd-px basaltic andesite breccia - coherent
213.7				Black shale
222.05				Feldspar xal sandstone - siltstone - black mudstone and interbedded red siltstone /mudstone
227.2	Py Si			Siltstone (strong Si Py alt)
230.7	SeClCo			conglomerate polymict
233				andesitic siltstone with carbonate banding
235				banded carbonate (or-pk-wh)
237				andesitic siltstone with carbonate banding
245.1	HmAbCo			lithic breccia (fd-hbl andesite) banded carbonate in matrix
256				banded carbonate
257				lithic breccia (fd-hbl andesite) banded carbonate in matrix
262	AbHm			Feldspar - hornblende phyric andesite
283.75	SiSeClEpAb Py			Feldspar- qtz phyric porphyry (6-7mm qtz)
343.5				brecciated feld-qtz porphyry
345.5				

LOG Andrew Jones — CODES — HOLE BL 5

date: 23/3/95 — grainsize — scale 1:200

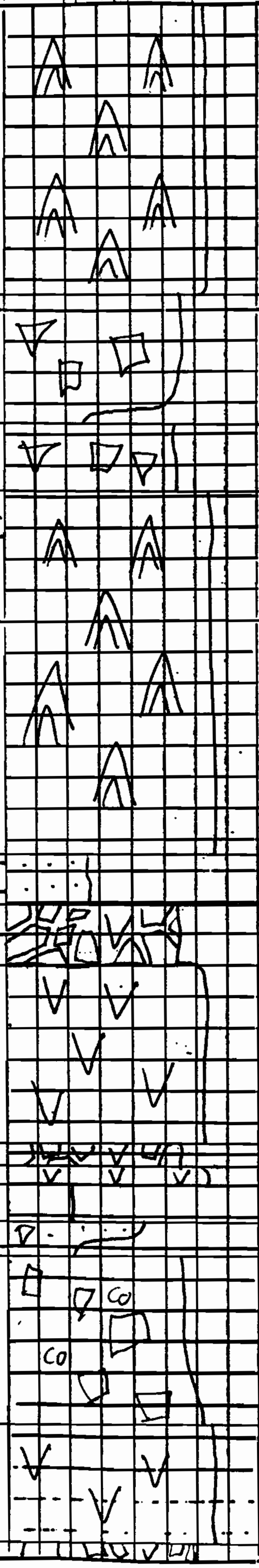
m	structure	grainsize	ML MP	S	description
0					Glacials /overburden 0 – 9m
9m					
10				Si Se	Massive coherent feldspar – hornblen ± pyroxene-phyric andesite - porphyritic but phenocryst abundance varies - feldspar phenocrysts to 4mm - hornblende phenocrysts to 11mm - pyroxene phenocrysts to ~ 1mm (feldspar ± hornblende andesite /dacite association of the Anthony Road Andesite)
20					
30	Fault				
				Se Si Py	
				Se	
40				Si	
50					

page 1 of

LOG

HOLE BL5

date: | grainsize | scale 1:200 | page 2 of 7

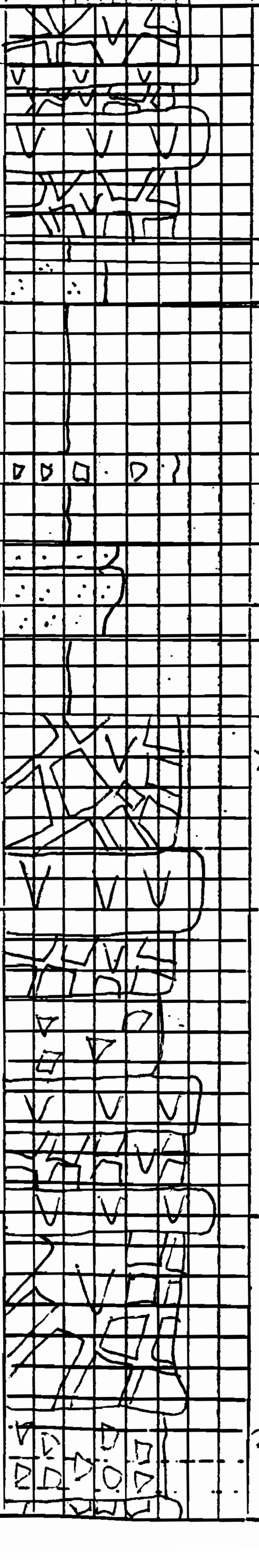


m	structure	ML MP	S	description
50			Se Si	Feldspar-hornblende-phyric massive coherent andesite
59.55, 60		7 cm		Monomict breccia / siltstone - clasts of phenocryst-rich (30%) fd-hbl andesite - andesitic derived siltstone
63.7	cleaved	6cm	Se Si	Monomict andesitic breccia - fd-hbl andesite clasts
66, 70	Fault [		Se Si	Coherent fd-hbl-px andesite - Flowbanded - porphyritic
77.5	Fault [		Si Se	Silicified siltstone - highly sheared
79, 80			Se Co	Insitu basaltic andesite breccia - clasts fd-px-phyric
81			Co Se	Coherent fd-px basaltic andesite - vesicles co filled (fd-px basaltic andesite association of the Anthony Road Andesite)
86.75			Se	Insitu bas and breccia
87.5			Co	coherent basaltic andesite intrusive
88	laminations at 40°			Laminated black mudstone.
89.05, 90		6cm		Fd-hbl andesitic sandstone → black mudstone
90.4		16cm	Se Co	Monomict breccia - angular clasts of fd-hbl andesite - matrix is white carbonate
95.70			Se	Coherent fd-px basaltic andesite - vesicles co filled - fd > px
99.4, 100				insitu basaltic andesite breccia

LOG

HOLE BL5

date: | grainsize | scale 1:200 | page 3 of



m	structure	ML MP	s	description
100			Co Se	Monomict breccia (insitu) - fd-px basaltic andesite clasts
102			Se	Coherent basaltic andesite
			Co	Insitu breccia
			Se	coherent basaltic andesite
				Insitu brecciated fd-px basaltic andesite -carbonate matrix -jigsaw fit of clasts
107.75	lamination 40°			Poorly laminated black mudstone
108.5				Fd-hbl xal andesitic derived sandstone
110				Massive black mudstone
115			Co	Monomict andesitic breccia
116	lamination at 20°			Black mudstone
117.90			Si Se	dacitic/andesitic derived sandstone -xals of feld, px, qtz
120				
121	lamination at 30°			laminated - massive black mudstone -pyrite bands
123.50		>20 cm	Co Se	Monomict basaltic andesitic breccia -clasts of px-fd basaltic andesite -carbonate in matrix -clasts have jigsaw fit texture
128			Se	Coherent fd-px basaltic andeside -vesicles carbonate filled or silica filh
130.5			Co Se	Insitu jigsaw fit breccia fd-px-phyric basaltic andesiteclas
			Co Se	Monomict breccia -angular clasts of fd-px basaltic andesite
135.4				Coherent fd-px basaltic andesite
137.20			Co Se	Monomict breccia (carbonate matrix) - clasts of fd-px basaltic andesite
139			Se	Coherent/brecciated fd-px basaltic andesi
140.50			Co Se	Monomict breccia -jigsaw fit texture - clasts of fd-px basaltic andesite -clasts angular (<1cm - 15cm size
146.2		2cm	Co Se	Monomict breccia - very angular fd-px basaltic andesi lithics
150				Monomict insitu breccia

LOG

HOLE BL5

date: | scale 1:200 |

m	structure	grainsize	ML MP	S	description
150			12cm	Co Se	Monomict fd-bx basaltic andesite breccia - jigsaw fit of clasts - carbonate in matrix
153			2cm	Co Se	Breccia - angular clasts of fd-px basaltic andesite - carbonate in matrix - monomict
155.5				Se Co	Coherent to brecciated fd-px basaltic andesite - where brecciated carbonate in matrix
160	Fault				
161.5			12 cm	Se Co	Monomict insitu breccia - clasts of angular fd-px bas and
164.3				Se	Coherent fd-px-phyric basaltic andesite
168					Monomict breccia - clasts of fd-px basaltic andesite - angular - carbonate matrix
170					
171.5					Coherent fd-px basaltic andesite
173.95					Black mudstone peperitic
174.4					Coherent basaltic andesite
176			10cm	Co Se	Monomict insitu breccia - clasts of fd-px basaltic andesite - carbonate in matrix
179.40					Black mudstone
179.8					
180				Co	Brecciated basaltic andesite with black mudstone incorporated
182.1	Flow foliation 50° to core			Se	Coherent fd-px basaltic andesite - pyroxenes alligned by flow banding
188.7					Black mudstone peperitic
189.05					
190				Se	Coherent fd-px-phyric basaltic andesite - brecciated locally
200					

LOG

HOLE BL5

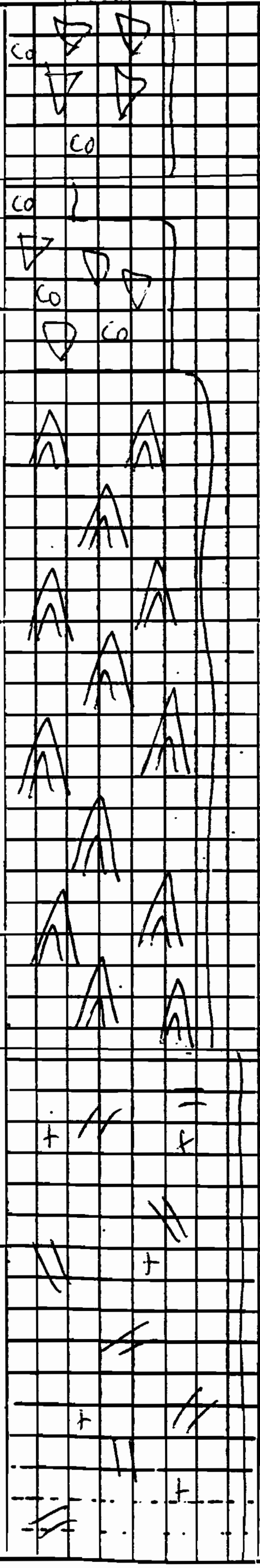
date: | grainsize | scale 1:200 | page 5 of

m	structure	ML MP	S	description
200				Coherent fd-px basaltic andesite
202.6			Se Co	Monomict breccia - angular lithics of fd-px basaltic andesite
204			Se Co	Massive coherent fd-px basaltic andesite - vesicles carbonate filled - xenoliths of black mudstone
210				
211.6				Monomict basaltic andesitic breccia - lithics angular; matrix carbonate fill
213.70	lamination < 5°			Massive to laminated black mudstone
220				
222.05	qtz veins; lamination 6°			Coarse grained feldspar crystal sandstone to black laminated mudstone
227.20			Py Si	Altered siltstone
230				
230.7		4cm		Polymict conglomerate - clasts of andesite and rhyolite
233				Andesitic derived siltstone - carbonate throughout
235	Banding 22°			Banded orange-white carbonate/siltstone
237	Banding 20°		Se Ca	Andesitic siltstone - carbonate throughout
240				
245.1		>20 cm		Monomict breccia - clasts of fd-hbl andesite - banded orange/white/pink carbonate in matrix
250				

LOG

HOLE BL5

date: | grainsize | scale 1:200



m	structure	ML MP	S	description
250	Banding at 35°			Monomict breccia -clasts of ~~fd~~-hbl-phyric andesite -carbonate in matrix
256			Hm Ab	limestone with siltstone
257				Monomict andesitic breccia - fd-hbl angular-blocky andesite clasts - carbonate (limestone) fills matrix
260				
262	Qtz-cl vein cleaved		Ab Hm	Coherent feldspar-hornblende-phyric andesite - hornblende phenocrysts to 5mm - feldspar phenocrysts to 3mm - feldspars commonly albite altered (feldspar-hornblende andesite/dacite association of the Anthony Road Andesite)
270				
280				
283.75	lots of pyrite		Se Si Py Py Si Se	Coarsely porphyritic qtz-feldspar rhyolite - feld > qtz (± hbl ± px) - qtz rounded-embayed with a fracture pattern (4-7mm) - feldspars commonly Ab altered (qtz-feld rhyolite association of the Anthony Road Andesite)
290				
300				

LOG

date:	grainsize	scale 1:200	HOLE BL5

m	structure	ML MP	s	description	page 7 of
300			Ab Se Si Cl	Massive qtz-feld rhyolite - qtz rounded to embayed (8m - feld euhedral to altered - alteration varies throughout 300·50 - 303·20 Ab of feld AbSe Py of groundmas 303·2 - 305 AbEp 305 - 317 ClSeEp with SiPy bands 317 - 331 SiSePy 331 - 333 ClSe + Py 333 - 338·2 Ab + ClSe 338·2 - EOH ClSe + Ep	
	Co Qtz veins				
310					
			Ep		
320			Cl Se Py		
	Fault				
330			Cl Se Ep		
	chalcopyrite in qtz vein				
340					
343·5			Se Si	Highly altered brecciated rhyolite	
345·5				E.O.H. BL5 345·50m	

LOG Andrew Jones Summary of HA1

HOLE HA1

date:

scale none

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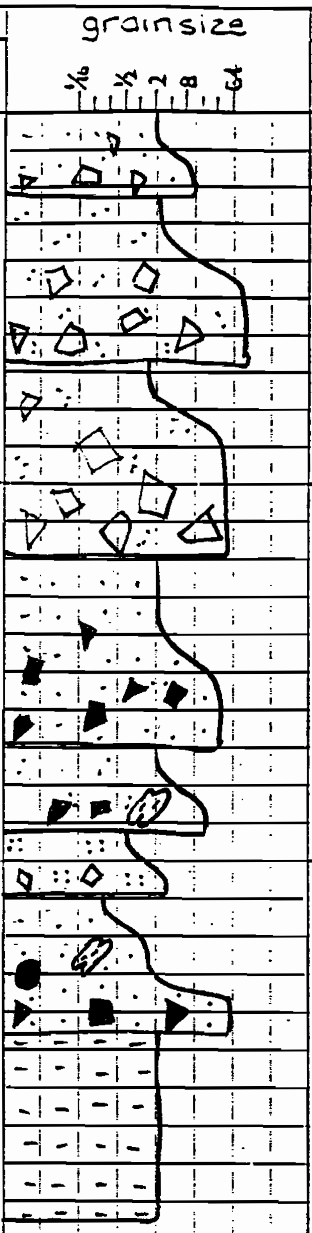
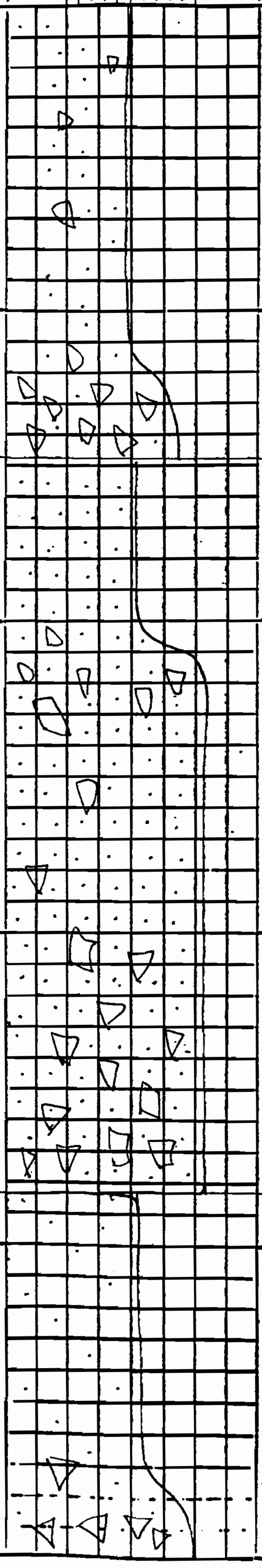


m	alteration	description
	SiSePy	Fd-hbl xal sandstone with fd-hbl phyric andesite lithics
14.70		fd-hbl sandstone - monomict fd-hbl andesite lithic-rich breccia
38.2		andesitic (fd-hbl) sandstone - lithic rich breccia
	minor Ab	
64.6		andesitic (fd-hbl) sandstone
		polymict breccia of fd-hbl phyric andesite, jasper fragments, fd-qtz phyric coherent
83		andesitic derived sandstone to polymict breccia with mst + fd-hbl andesite lithics
89		andesitic sandstone (fd + altered hbl?)
92		feldspar sandstone (+hbl) to polymict breccia; lithics of mst, fd-hbl andesite, fd-qtz rhyolite
	ClSe Ab minor HmPy	
117	Si	andesitic/dacitic derived sandstone with feldspar xals and minor hbl?
	SeEpHmCo	
137.5		

LOG Andrew Jones | CODES | HOWARDS ANOMALY 1 | HOLE HA 1

date: 17/6/94 | grainsize | scale 1:200 | page 1 of

m	structure	grainsize	ML MP	s	description
0	core broken			Si Se Py Ab	Andesitic sandstone/breccia - clasts of angular fd-hbl andesite - fd euhedral to 4-5mm - hbl euhedral to 5-6mm with lots 1-2mm - hbl often altered
	cleaved		7cm		- disseminated pyrite throughout - matrix of xals and finer material
10	weakly magnetic		2-3 cm		(Fd-hbl andesite/dacite association of the Anthony Road Andesite)
14.70				Si Se Py	Fd ± hbl xal-poor sandstone to monomict andesitic breccia - sandstone with euhedral-angular feldspar xals and possible hornblende - clasts of angular fd-hbl-phyric andesite - clasts often Se altered - fd often Ab altered
20	weakly magnetic				
30			<1cm	Si	
	Co vein (1cm)		12cm	Si Se ± Py	
38.2					Coarse grained sandstone/breccia - feldspar xals euhedral-angular-rounded - clasts of andesite/dacite are blocky to angular - matrix is SeClSi altered
40	CoQtz vein (1.5cm)			Py	
	Co vein (1.60cm)				
	1-3cm Co veins		2-3 cm	Py	
50					



LOG

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HOLE HA1

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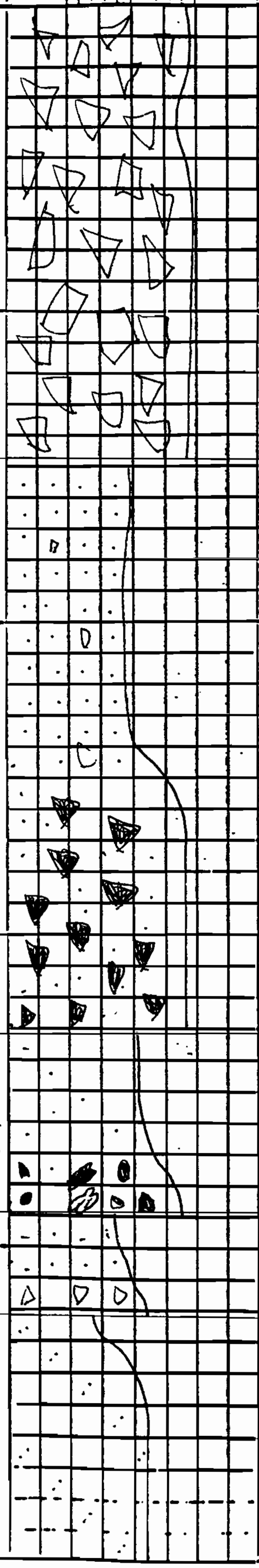
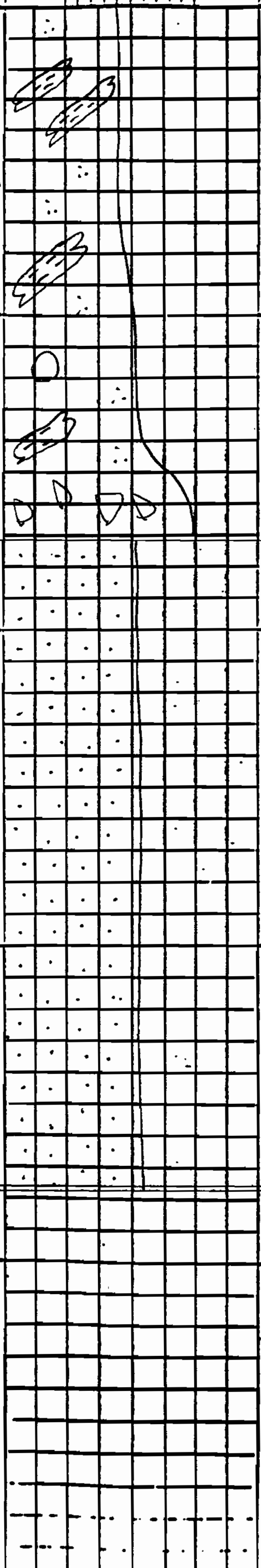


m	structure	ML MP	S	description
50		3-4 cm	Si Se Py	Monomict andesitic breccia - curviplanar to blocky clasts - monomict of fd-hbl andesite - jigsaw fit in places - andesitic matrix
60		1-2 cm	Ab	
64.60	magnetic	2-3 cm	Ab Se Cl	Andesitic sandstone to polymict breccia - sandstone contains fd, hbl xals - finer sand/silt commonly Si Se altered - clast supported breccia - clasts of fd-hbl-andesite - red jasper - fd-qtz rhyolite
80				
83.10	Py veins < 1cm	1-2	Se Py	Fd-xal sandstone (medium - coarse grained) and polymict breccia - clasts of fd-hbl andesite - rounded shale clasts - siltstone
89				
90		1-3cm	Py Se	Medium grained volcanic sandstone (fd xals) with fd-hbl andesite clasts (angular)
92			Cl Se Ab Si Hm Py	Fd-hbl xal bearing sandstone - fd angular & altered to AbSe - hbl embayed to euhedral
100				

LOG

HOLE HA1

date: | grainsize | scale 1:200 | page 3 of



m	structure	ML MP	S	description
100–117	Co vein Si Co Ab vein (8cm) CoCl Hm vein (1.5cm) Co vein (3cm) magnetic	2-4 cm	Cl Se Ab Si Si	Clast bearing fd-xal volcaniclastic sandstone - fd xals < 1mm to 5mm - mudstone/shale clasts - rounded qtz-fd rhyolite clast (qtz to 2mm) - Some hbl xals
117–137.50	EpAb vein (4cm) co veins (1-1.5cm) magnetic		Se Ep Hm Co Se Co	Altered feldspar crystal sandstone - euhedral to angular fd 1-4mm - minor Cl altered hbl xals - minor small altered lithics
137.50				E.O.H. HA1 137.50

Depth marks: 100, 110, 117, 120, 130, 137.50

LOG Andrew Jones Summary of HA2

HOLE HA2

date:

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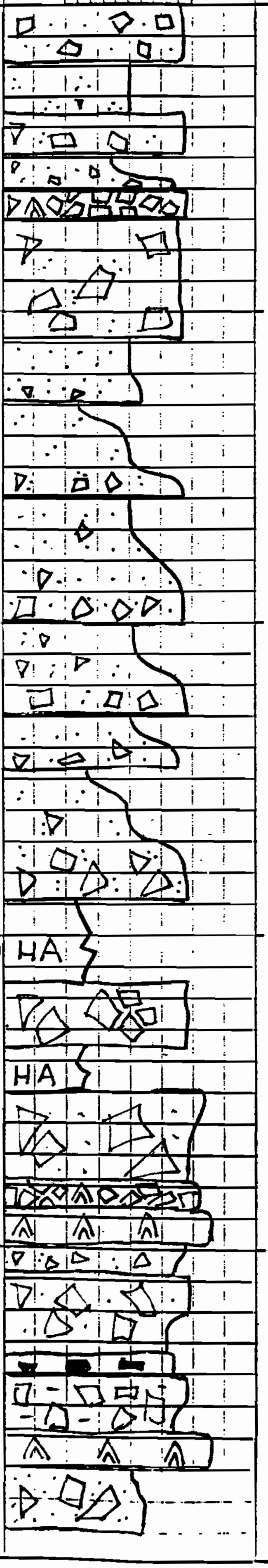
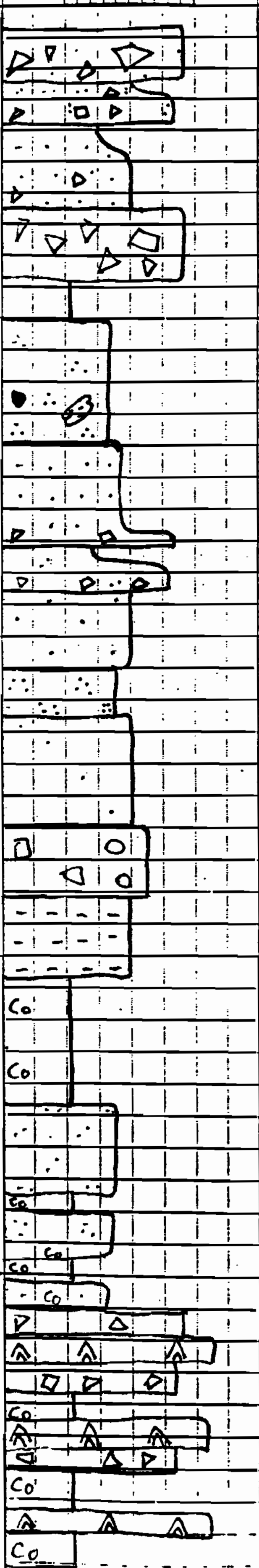


m	alteration	grainsize	ML MP	S	description
	SeCoPyAb				monomict breccia; lithics of fd-hbl phyric andesite, andesitic matrix
17.20					fd-hbl xal sst
21.70	SePy				monomict breccia; fd-hbl phyric lithics
60	SiSeAbClEp				fd-hbl sst – fd-hbl phyric andesite lithic-rich breccia
68.8	SeAbCo				jigsaw fit breccia; fd-hbl phyric andesitic lithics
69.5					monomict breccia; lithics of fd-hbl phyric andesite
	SeAbCoCl				
98	SeSiPy				fd-hbl xal sandstone with fd-hbl andesite lithics
109					fd-hbl xal siltstone – sandstone – breccia (breccia with lithics of fd-hbl andesite)
	ClEpCoSe				
129					andesitic (fd-hbl) sandstone - breccia
144.5					fd-hbl andesite lithic bearing breccia with fd-hbl sandstone
154					andesitic (fd-hbl) sandstone – monomict breccia
156					fd-hbl sandstone/siltstone
					monomict fd-hbl lithic breccia
170.5	SiCoEpClHm				Highly altered ?
185	CoSiEpClAb				monomict breccia; fd-hbl phyric andesite (rare jigsaw fit)
190	SiCoEpClHm				highly altered?
193	ClEp				monomict fd-hbl andesitic breccia (rarely has jigsaw fit texture)
203					(jigsaw fit) monomict fd-hbl andesite breccia
204	ClEpCo				coherent fd-hbl andesite
205					monomict fd-hbl andesitic breccia
207					andesitic (fd-hbl) monomict breccia
234					Polymict breccia; fd-hbl andesite + qtz-fd phyric clasts
235					clast supported monomict breccia (fd-hbl andesitic lithics)
248					fd-hbl phyric coherent andesite
249					fd-hbl andesitic sandstone – monomict breccia
259					

LOG Andrew Jones HA3 summary

HOLE HA3

date: | grainsize | scale none | page 1 of 1

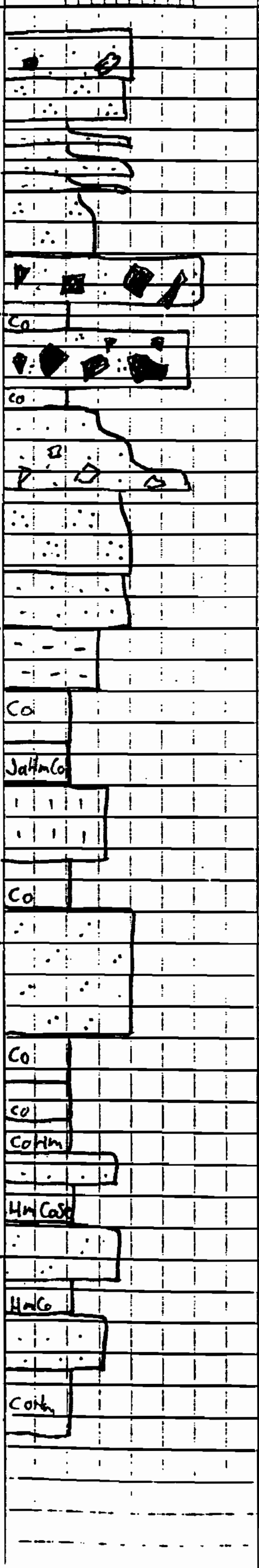


m	alteration	ML MP	S	description
2.2	SiSe			monomict breccia with fd-qtz xal sst matrix lithics of fd-qtz phyric coherent
7.3				monomict breccia (fd-qtz coherent lithics)
9.7				feldspar-qtz sandstone
16.8				monomict breccia (lithics of qtz-fd coherent)
31.4	chlorite + minor carbonate			Black shale
36				Feldspar-quartz xal bearing sandstone polymict (lithics of mudstone, fd-qtz sandstone)
46.3	chlorite strong			Feldspar crystal bearing sandstone
	SeHm SiCl			lithics of siltstone at base
59.45				fd-qtz sandstone - breccia (lithics of fd-phyric coherent)
61.90	SeSiPy			fd + minor qtz + hbl? sandstone
100.60				fd-qtz xal sandstone
106.70	SeSiCoHm			altered feldspar xal bearing sediments
120.70				altered unit (feldspathic) with fd bearing lithics?
129.60				Feldspar xal bearing m.g.-c.g. sandstones (feldspars hematite altered)
148.80	CoHmSe AbPy bands			Banded carbonate (white-purple-green-grey)
170.10				feldspar-hbl xal sandstone (altered)
179.3				massive carbonate (wh-gn-pk)
180.80				carbonate/sandstone
190.20				massive carbonate (wh-pk-pp)
192.70				carbonate/sandstone
197				breccia of fd-hbl andesite lithics; matrix carbonate
203				fd-hbl coherent andesite
203.50				fd-hbl lithic andesitic breccia
205.40				banded carbonate (wh-pp-gy)
206.40				fd-hbl coherent andesite
208.30				breccia of fd-hbl andesite lithics
211.60				banded carbonate (wh-gy-pk-gn)
222.60				fd-hbl andesite
230.80	SiSeHm			banded carbonate (wh-pk-bl-gn)
244	CoSeHm			

LOG Andrew Jones HA4 summary

HOLE HA4

date: | scale: none | page 1 of 1



m	alteration	description
40.10	Cl - SiAb	fd-qtz xal sst with mst + f.g. qtz-fd coherent lithics
45		chl-Ab banded fd-qtz xal rich sst
53.20	seSiCl	sequence of msts-sist-ssts (laminated msts; fd-qtz sists, ssts)
73.20	SeClCo minor Hm	f.g. qtz-feld sst
82.10	Hm Ab	Polymict breccia; lithics of fd-hbl andesite, sist, carbonate.
88.20	seClSi Co	Banded Hm coloured carbonate
91.5		Polymict clast supported breccia; lithics of fd-hbl andesite + fd-qtz porphyry
114.5		Banded carbonate-hematite-jasper
115	SeCl minor CoHm	Feld-qtz sist-sst-conglomerate/breccia lithics of feld-qtz coherent
129.5		fd-qtz xal rich sandstones
164		Feldspar xal dominated sst (possible minor qtz)
204		strongly Hm SeCo altered sediment
217.2	Hm Co	Banded massive carbonate (wh-pp-gn-gy)
231	mt-hm-co	Banded jasper-hm-co-magnetite
238	SeCoHmCl	HmCoSeCl altered feldspathic sediment?
256	HmCoSe	Banded carbonate (Hm coloured)
267.6	ClSeHmCo	altered HmCoSe sists-ssts feldspathic (feldspar xals Ab or Se alt)
294	SeHmCo	seHmCo unit (banded)
303.9	Co	massive banded carbonate (wh-pk-pp-gn)
306.2	Co - HmSe	banded carbonate and Hm Se sediment zones
309.5		feld sists/ssts (feld xals Ab or Se altered)
313	Hm Co Se	HmCoSe banded altered sediments?
326		feld-qtz sandstones
350.8	Hm CoSe	HmCoSe alt. banding in seds
361.7		Feld xal ssts (feld Ab altered)
370	Hm Co	Banded HmSeCo unit (no original sediment texture preserved)
403.1		

LOG Andrew Jones	CODES	HOWARDS ANOMALY 4			HOLE HA4
date: 23-24/6/94	grainsize	scale	1:200		

m	structure	grainsize	ML MP	s	description	page | of
0					Overburden and weathered materi[al] 0 → 40.10m	
10						
20						
30						
40						
40.1	Co vein (6cm) CoQtz veins	43	6cm	Cl Si Ab	Crystal-rich sandstone - quartz xals angular - feldspar xals euhedral - clasts of mudstone, rhyolite, carbonat[e]	
45	magnetic Qtz CoCl vein (5cm)			Cl Si	Crystal-rich sandstone - feldspar - quartz crystals - Cl - Ab banded - magnetite bands (Tyndall Group)	
50						

LOG

HOLE HA4

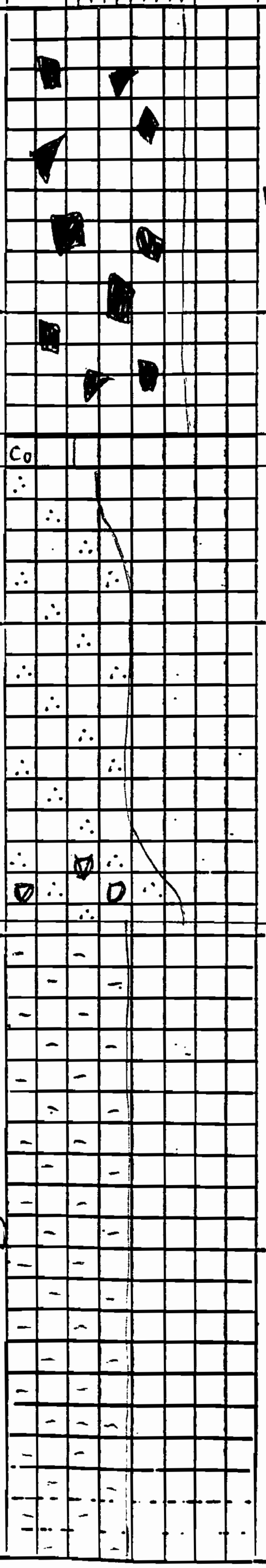
date: | grainsize | scale 1:200

m	structure	ML MP	S	description
50	CoQtzCl vein (18cm)			Feld-quartz sandstone
				Graded sandstones/mudstones
	non magnetic		Se Si Cl	laminated/non laminated mudstones to quartz-feldspar sandstone bases
	Qtz Co Cl vein (1.5cm)			Graded mudstones/sandstones - younging uphole
60				thinly laminated mudstones/Qtz-fd sandstone - clear volcanic quartz to 8mm
	non magnetic			laminated mudstone / qtz-fd sandstone
70				laminated mudstone (volcanic) to qtz-fd sandstone - scoured bases - younging uphole
	magnetic		Se Cl Co Hm	Siltstone / fine grained sandstone - xals of qtz and feldspar - SeCl alteration throughout
80				
		20cm	Hm Ab Se Cl	Polymict breccia - angular clasts of fd-hbl-phyric andesite (Hbl to 5mm; Fd to 4mm), carbonate clasts, hematitised siltstone
			Si Co	Poorly sorted qtz-fd sandstone
90				Bedded limestone (white-purple)
	QtzCoCl vein (10cm) magnetic		Se Cl Ab Si	Volcanic derived polymict breccia - clasts of fd-hbl-porphyritic andesite (70-80%) and qtz-fd phyric rhyolite (30-20%) - feld-qtz sandstone matrix
100				

LOG

date: | grainsize | scale 1:200 | HOLE HA4 | page 3 of

m	structure	ML MP	S	description
100–114	non magnetic CoQtzCl vein (5cm) CoQtz vein (7cm)	12 cm		Clast supported polymict breccia - angular clasts from 1cm – >1
114–115				Banded limestone
115–129.5	magnetic non magnetic		Se Cl Hm	Siltstone/ sandstone / conglomerate - highly altered - feld + qtz xals (feld > qtz) - clasts of rounded qtz-feldspar-phyric rhyolite?
129.5–150	Sph Sn Py vein (1-5cm) non magnetic		Se Cl Co Hm	Crystal poor qtz-feld sandstone - feld % > qtz % - rounded clear qtz to 2mm - chloritised wisps to 3cm - not xal-rich



LOG

HOLE HA4

date: | grainsize | scale 1:200

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m	structure	ML MP	S	description
150	Qtz Co vein (7cm); weakly magnetic; Cl Co Qtz vein (3cm)		Se Ab	Feldspar - qtz massive volcaniclastic sandstone - fd xal content >> qtz - 5-10% of unit is xals - feldspar crystals are angular to subrounded
160				
164	Qtz Co Co vein (3cm); non magnetic		Se Hm Cl Co	Feldspathic highly altered siltstone / sandstone - feldspar crystals HmSe altered and strung out by cleavage - possible minor fine grained quartz - Hm as replacement of feldspar xals and as alteration bands
170				
180				
190	magnetic; magnetic; Cl Qtz Co Py vein (5cm)			
200				

LOG

date: | grainsize | scale 1:200 | HOLE HA4 | page 5 of

m	structure	ML MP	s	description
200				
204	magnetic			Strongly Hm Se Co altered cleaved siltstone
	Co vein (5cm)		Hm Se	- feldspar crystals still visible though dominantly replaced
210	CoQtzCl vein (19cm)			- matrix is fine grained and altered
				- no qtz
	magnetic		Co Hm Se Cl	
217.2			Hm	Massive - bedded limestone
220				- strongly hematitic with areas of almost jasper (magnetic)
				- beds a few mm to 3cm
				- cleavage is strong
	non magnetic			- banding (bedding) orientation is not consistently oriented
230				
			Hm	
	strongly magnetic			
238				Hm Co Se Cl altered cleaved siltstone / sandstone
240			Se Co Hm Cl	- feldspar is the dominant crystal
				- fine grained magnetite and quartz are lesser components
	magnetic			- matrix altered
250				

Grainsize column annotations: Co (217.2 m), Co, Co, Co, Co (238 m).

LOG

HOLE HA4

date: | grainsize | scale 1:200

m	structure	grainsize	ML MP	S	description
250–256	non magnetic				
256	CoQtz vein (5cm) non magnetic	Co … Co		Hm Se Cl	Bedded Hm altered limestone - bands 1mm - 1cm - calcite
260					
267.6	magnetic CoQtz vein (2cm) CoHmCl vein (16cm) pyrite bands			Cl Se Cl Se Ab Cl Se	Strongly altered & cleared siltstones / sandsones - zonal alteration (SeCl. and Ab zones) - subrounded feldspar crystals are Ab or Se altered
270					
280					
290					
294	magnetic	Co … Co		Se Cl Hm	limestone and altered siltstone - Hm Se alteration throughout - altered sediment bands to 27cm - Hm bands ~ 2cm
300					

LOG

date: | scale 1:200

m	structure	grainsize	ML MP	s	description
300 – 309.50	non magnetic	Co		Hm Co Se Cl	Bedded limestone with bands of HmSeCl altered fd-siltstone - grading not evident - beds in limestone different colours (Wh-Pp-Gn-Gy)
309.50 – 313.2				Se Ab	cleaved and altered siltstone - feldspar crystals subrounded-rounded and replaced by SeAb
313.2 – 326	non magnetic	Co		Hm Co Se	Massive bedded limestone - Hm is strong giving a red colour - Se altered fragments throughout - original limestone overprinted by Hm?
326 – 350	weakly magnetic Ep veins magnetic			Se Cl Cl Ep	Fd-qtz xtal rich sandstones - altered and cleaved - feldspar crystals closely packed and commonly Cl altered or Se altered - feld subangular - chlorite alteration of f.g. matrix.

Depth marks: 300, 309.50, 310, 313.2, 320, 326, 330, 340, 350

LOG

HOLE HA4

date: | grainsize | scale 1:200 | page 8 of 9

m	structure	grainsize	ML MP	S	description
350 350·8 – 361·7	non magnetic	Co Co Co			Massive to colour banded limestone - massive areas white but banding varies from white/orange/red/purple - lots of hematite - Se altered fragments throughout carbonate. - cleavage overprints
361·7 – 370	Fault CoQtz vein 5cm magnetic			Ab Se Cl Co Hm	Feldspar xals sandstones - feldspar angular and closely packed (to 2·5mm) - fine magnetite throughout - Albite and chlorite alteration common
370 – 400	Fault ZONE magnetic Co vein (<5mm) Fault non magnetic Qtz vein (8cm) CoQtzEp vein (9cm) non magnetic	Co Co Co Co		Hm Se	Banded carbonate (limestone) - Se and Hm widespread - bands different colours - foliation developed parallel to banding - could be carbonate replacing fine grained sediment

Depth marks: 350, 360, 370, 380, 390, 400

LOG

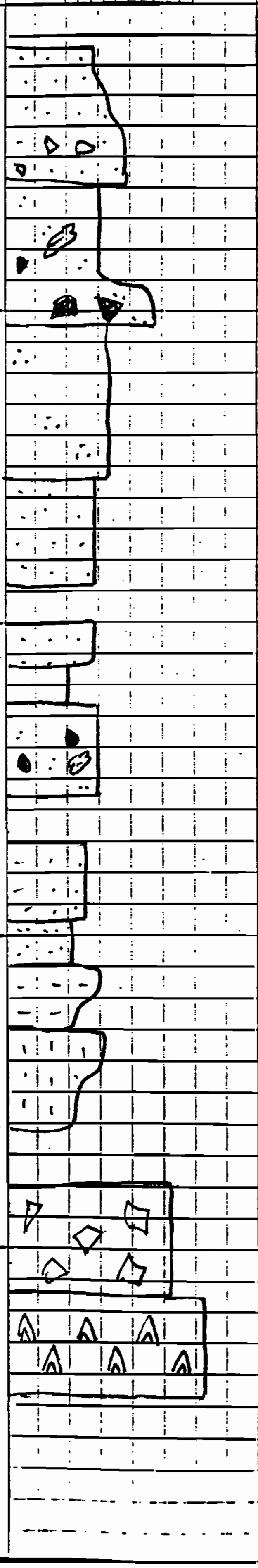
date:	grainsize	scale 1:200	HOLE HA4

m	structure	grainsize	ML MP	s	description
4.00 – 403.1	non magnetic	Co / Co		Hn	Banded Carbonate - white/red/green
403.1					E.O.H. HA4 403.1m

LOG Andrew Jones - Summary of HA5

HOLE HA5

date: | scale none | page 1 of 1



m	structure	ML MP	s	description
12	Cl			fd-qtz sandstone (feld phyric clasts)
25.4	Se	faulted		fd-qtz sandstone (mst, chert, fd-qtz sst, fd-phyric coherent lithics in breccia)
	SiHm Py			feldspar xal-rich sandstone with lesser quartz
	SeClHm			
118.2				andesitic derived sandstone (fd + minor hbl)
171				
174				fd-hbl? sandstone
178				gn-pk shale
179.1	A6Cl			feldspar sandstone, lithics of shale + chert (albite - chlorite alteration bands)
193		Fault		
199				fd-hbl xal sandstone
	AbSe			
208				fd xal bearing sandstone
212				fd xal bearing sst-sist
215	hm py.			fd xal bearing sandstone
225				f.g. shales ...
265	SeHm			fd-hbl lithic monomict breccia
274	Ab ClAb AbSe			feldspar-hornblende phyric andesite
297.5				

LOG Andrew Jones HA6 summary

HOLE HA6

date:

scale none

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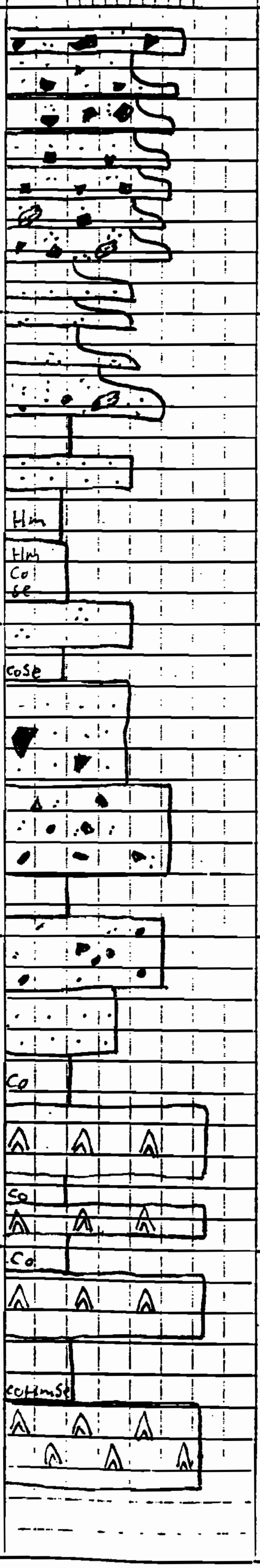
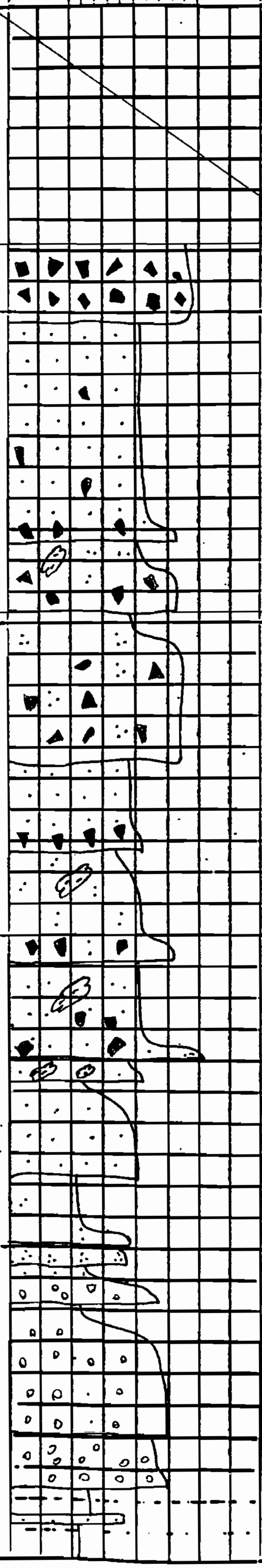
grainsize



m	alteration	ML MP	S	description
7.8				
10.2	ĀbClSeSi			Fd-qtz xal rich sandstones – breccia/conglomerate
				lithics of mst, fd-qtz sst, pp fd phyric dacite, red qtz-fd phyric rhyolite, cl alt fd phyric
17.60				
19.50				
24.40	AbCl ClSeSi			
27.40				
30.80				
33.50				FAULT
37.5				mst - f.g. sist/ssts (fd-qtz)
39.8				
40.5				fd-qtz sst (mostly feld) with mst + dacite lithics
47.5				non laminated grey mudstone
52				Feldspar xal rich sst
54	Hm Cl			fault (54-67)
				Hm altered original sediment?
67	HmCoSe			Banded HmCoSe units (sists/ssts/carbonate)
94	SeCoSi			fd-qtz sandstone
109.50				Banded carbonate – sericite
111	HmCoSeCl minor Ab			m.g. feld xal sandstone (minor lithics of fd-hbl andesite)
127				Polymict conglomerate; lithics of fd-hbl andesite, m.g. fd xal sst, silicified sediment; hm frags
142	CoSeHm			Banded Co-Se-Hm unit
144	SeCo + Ab			Polymict conglomerate; lithics of clalt feld coherent, hm frags, silicified sed, albitised coherent
153.6	HmSeCo jasper			m.g. - c.g. fd-hbl sandstone
176.9	CoHmSe			massive white carbonate to banded carbonate (wh-pp-bl-gn)
182.5	HmCo			Feld-hbl phyric andesite
206	Co			banded carbonate (wh-pp-gn)
207	HmCo			Fd-hbl phyric coherent
212	Co			Banded carbonate (wh-pp-gn-gy)
212.8	HmAb SeClCo			Fd-hbl phyric andesite
226.2	hm-co-se-cl			Altered hm-co-se banded units
242.5				Fd-hbl phyric andesite
250				

LOG Andrew Jones	CODES	Howards Anomaly 6	HOLE HA6
date: 25-26/6/94	grainsize	scale 1:200	page 1 of 5



m	structure	ML MP	S	description
0				Unconsolidated glacial overburden
7.8	non magnetic		Ab Cl Se Si	Polymict conglomerates/breccias to coarse grained Fd-qtz xal-rich sandstones
10				-clasts of 1) fd-qtz xal-rich sandstone 2) mudstone 3) Fd-phyric dacite (purple) 4) Qtz-Fd-phyric rhyolite (red) 5) fine grained chloritised clasts
	Qtz vein (2.5cm) Qtz vein (4cm)		Cl	
			Si	-some quite coarse clear qtz xals in matrix
	Qtz-Py vein (12cm)		Ab Cl	- dacite clasts dominate
19.50 20				Fd-qtz chlorite altered xal-rich sandstone
		5cm <1cm	Cl Se Si	Polymict conglomerate with fd-qtz sandstone matrix -clasts angular-subrounded of qtz-fd rhyolite and silicified rounded mudstone -clast supported base
24.40		2.5cm	Cl Se	Grey fd-qtz xal sandstone -qtz xals m.g. to c.g. and clear -angular clasts
		12cm		Fd-qtz closely packed xal-rich sandstone -Fd euhedral to angular -qtz clear & subangular -mudstone and dacite clasts
30 30.80		5cm		Sandstone - breccia -fd-qtz xals -mudstone clasts, rhyolite & dacite
	Co vein (8cm)			
				Fd-qtz xal rich sandstone with mudstone
			Se Cl Si	Fd-qtz-xal-rich sandstones to monomict conglomerates -clear angular - euhedral quartz -clasts of silicified grey mudstone
40				Conglomerates matrix supported to clast supported bases [all younging up hole]
				Grey non-laminated mudstone Fd-xal sandstone
50				Grey mudstone

LOG						HOLE HA6
date:		grainsize	scale 1:200			
m	structure		ML MP	S	description	page 2 of
50					Grey mudstone	
52				Se	Feldspar xal rich sandstone	
54	Fault [	Hm		Hm Cl	Highly altered Hm fine grained sediment	
60						
67	Banded HmCo	Hm / Hm Co Se		Hm / Hm Co Se	Banded HmCoSe altered zone - Co bands to 4cm (wh-orange) - appears to overpint earlier mudstone. - Hm bands to 6cm (purple)	
70	weakly magnetic					
					- intense alteration	
80				Co Hm		
90	Hm Co banding					
				Se Si Co	Green variably foliated fd-qtz xal Sandstone - fd > qtz - fd subrounded 1-4mm - qtz clear to 2mm	
100						

LOG

HOLE: HA6

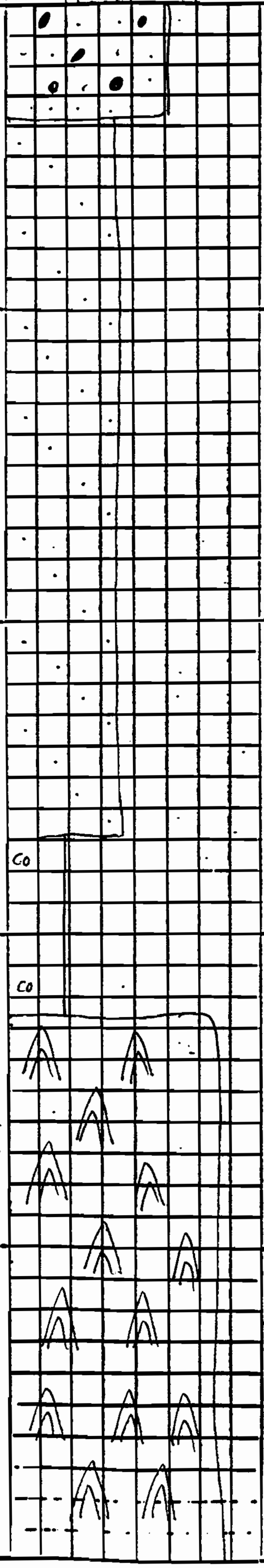
date: | grainsize | scale 1:200 | page 3 of 5

m	structure	ML MP	S	description
100	Co vein (1cm)		Si	Cleaved fd-qtz siltstone/sandstone -qtz to 2mm; clear and angular - feld elongate to 2mm -very altered
109·5 110 111·6	CoQtz vein (9cm)			Highly Co/Se altered. zone
	Hematite zones magnetic	40cm	Hm Co Se Ab Se Cl Hm Ab Co	medium grained fd-xal bearing sandstone - several clasts throughout including fd-hbl andesite
120				
127	magnetic			Polymict conglomerate - clasts rounded - subangular 1) white silicified sist 2) Se altered fd-xal sandstone 3) Hm altered sediment 4) Fd-hbl andesite .
130			Hm Co Se Cl Ab	
135	magnetic	6cm	Hm Se Co	coarse grained sandstone/conglomerate -cleaved -clasts elongate with cleavage 1) silicified qtz-phyric rhyolite 2) fd-hbl andesite 3) silicified mudstone
140 141				Fd-qtz sandstone
142	Co vein (1cm)		Se Co	Banded intensely Co Se Hm altered zone
144	magnetic	2cm	Ab	Polymict conglomerate - rounded to subrounded clasts < 4mm to 2cm clasts 1) Hm altered ? 2) chlorite altered fd-sandstone 3) silicified siltstone 4) albitised sandstone/rhyolite ?
150				

LOG

date: | grainsize | scale 1:200 | HOLE HA6 | page 4 of

m	structure	ML MP	s	description
150				Clast supported conglomerate - fd-qtz sandstone matrix - clasts rounded to elongate with cleavage
153.60			Hm Se Co Ja	Medium grained to coarsegrained feld-hbl xal-bearing sandstone - strongly altered - xals strung out in cleavage
160	minor jasper			
	qtz Cl Co vein (14cm)			
	Magnetic		Se Cl	
170			Ab Hm Se Co	
	Magnetic			
176.90	Hm Co Banding		Co Hm Se	Massive white carbonate to colour banded carbonate - white zones to 5cm - wh-purple/red banded zones
180				
182.5	Co Si vein (3.5cm) Magnetic		Hm Co	Brecciated to massive fd-hbl-phyric andesite (fd-hbl andesite)dacite association of the Anthony Road Andesite) - euhedral feldspar to 4mm - tabular hornblende to 6mm - fracturing could be fault related - phenocrysts evenly distributed where not altered.
190	ClCoQtz vein (3.5cm) CoQtz vein (2cm) magnetic		Hm Co	
200				

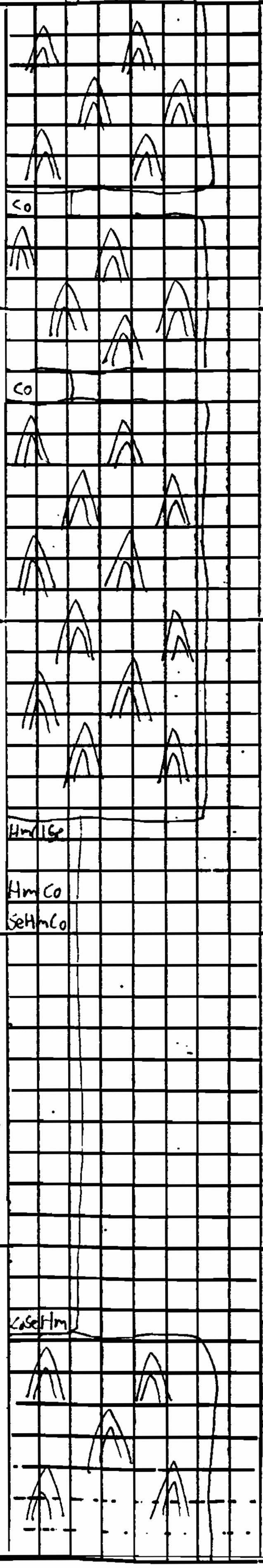


LOG

HOLE HA6

date: | grainsize | scale 1:200 | page 5 of 5

m	structure	ML MP	S	description
200				Fractured coherent andesite
206	CoQtzCl veins (<4cm)			Banded white - purple - green carbonate
207			Hm Co	Massive coherent fd-hbl andesite - hbl altered in places - fd preserved
210	EpCo vein (3cm)			
212				Banded Wh-Pp-Gn-Gy carbonate.
212.8	magnetic		Se Cl Hm Ab Co	Fd-hbl porphyritic andesite - fd phenocrysts to 3mm - hbl phenocrysts to 4mm - intense HmAb alteration in places
220			Hm	
226	magnetic		Se Cl Hm	Strongly cleaved zone 226 - 242.5m - banded HmCoSe altered sediment and limestone
230	HmCo banding weakly magnetic			
240				
242.5	CoClQtz vein (7cm		Hm Ab Co Se	Coherent fd-hbl andesite/dacite - feldspar phenocrysts euhedral to subangular to 3mm - hbl phenocrysts euhedral to 5mm - alteration pervasive in places
250				



E.O.H HA6 250.0m

LOG Andrew Jones HA7 summary

HOLE HA7

date:

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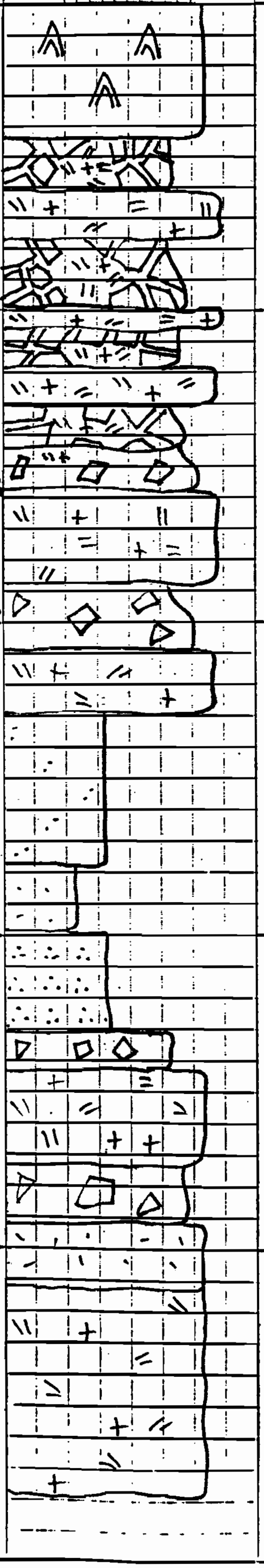
m	alteration	grainsize	ML MP	S	description
	sericite-hematite				Feldspar-hornblende phyric porphyritic andesite
20.1					Jigsaw fit monomict breccia (qtz-feldspar porphyry lithics)
26.6					Qtz-feld porphyry
28.1					Jigsaw fit texture in monomict breccia (qtz-feld porphyry lithics)
33.5					Qtz-fd porphyry
35.8					Jigsaw fit breccia (qtz-feld porphyry lithics)
41					Qtz-feldspar porphyry
42.5					Jigsaw fit texture in monomict bx
47	sericite-hematite-chlorite				monomict breccia (non jigsaw fit) fd-qtz porphyry lithics
69					Qtz-feldspar porphyry
81	silica				
86	sericite-silica albite-chlorite				
94					Monomict breccia of qtz-fd porphyry lithics. Non jigsaw fit.
103	sericite-silica-chlorite				Qtz-feld porphyry
111					Feld-hbl volcaniclastic sandstone
131.5	hematite-carbonate				
138					Grey-black sist (siltstone)
140	sericite-silica-pyrite				
143					Feld + qtz xal sandstone
149					Monomict breccia (qtz-fd porphyry lithics)
151					Qtz-feld porphyry
163	Se Si Ab Cl				Monomict breccia of qtz-feld porphyry lithics
165					Rhyolite (fine qtz-feld phenocrysts) chilled margin ?
167	Si Se Py				
172					Qtz-feldspar porphyry
233.5					

LOG Andrew Jones | CODES | HOLE HA7

date: 19,20/6/94 | grainsize | scale 1:200 | page 1 of 5

m	structure	ML MP	S	description
0	no core			Tricone to 1m
1	non magnetic magnetic SiCoCl veins (1cm)		Se Hm Hm Se	Feldspar-hornblende-porphyritic andesite (fd-hbl andesite/dacite association) -hbl phenocrysts mostly Hematite altered -hbl euhedral to 8mm -fd phenocrysts euhedral to angular -fd to 4mm -groundmass destroyed by sericite Massive unit becoming more feldspar-phyric (dacitic) -fd to 5mm -remnant hbl throughout
10				
20		HmSe Se		Brecciated rhyolite -monomict -jigsaw fit of clasts -qtz-fd phyric -matrix strong hematite alteration
23	SiSe veins (2-3mm)			
26	Co vein (5mm) minor Hm zones		Se Hm	Qtz-fd porphyritic rhyolite (qtz-fd rhyolite association)
30			Hm	Monomict: brecciated rhyolite -qtz-fd phyric clasts -qtz to 3-4mm (rounded) -fd to 5mm -jigsaw fit of lithics
33.5	Co veins (2-6mm)			coherent qtz-fd rhyolite -qtz embayed to rounded
35.8	SeCo veinlets (1-3mm)			Monomict rhyolitic breccia -insitu -clasts have a jigsaw fit texture
40				porphyritic qtz-fd-rhyolite -qtz evenly porphyritic
	magnetic			-Rhyolitic breccia -jigsaw fit of clasts -strictly monomict
47		1-3 cm >6cm	Se Ab Se Hm Cl	Monomict rhyolitic breccia -clasts not jigsaw fit fd to 4mm; embayed qtz 4-5mm
50				

LOG

HOLE HA7

date: | scale 1:200 | page 2 of [illegible]

m	structure	ML MP	S	description
50	weakly magnetic		Se Cl Hm	Monomict rhyolitic breccia (Hm altered) - jigsaw fit texture
		2-4 cm	Se	Monomict rhyolitic breccia - clasts of qtz-fd rhyolite - jigsaw fit of clasts
60		1-3 cm 4-5 cm	Hm Se Ab	Breccia - angular to elongate fd-qtz rhyolite clasts - some clasts SeCl altered some SeAb - qtz rounded (to 5mm) - fd euhedral (to 5mm) - monomict - matrix fine grained with small clast fragments
67.8	Co vein (8mm)			
69.20 – 70				qtz-fd rhyolite
70.5	CoClSi vein (3cm)	1-3 cm	Se Hm	Jigsaw fit breccia - rhyolite clasts
72	Carbonate vein (8mm) CoCl vein (8cm)		Se Hm Cl	coherent qtz-fd porphyritic rhyolite - minor brecciation - pervasive Hm Se alteration
78 – 80				Monomict breccia - angular lithics define a jigsaw fit textur[e] - clasts of qtz-fd-rhyolite
81	Hm veins (<1cm) silica flooding		Si	Porphyritic qtz-fd rhyolite - qtz to 6mm (rounded) - fd to 4mm (Ab-Cl altered) - groundmass SeSi altered
	non magnetic		Se Si Ab Cl	Finely porphyritic coherent qtz-fd rhyolite - qtz < 1mm to 4mm is rounded
90			Se Si	Coarsely porphyritic qtz-fd rhyolite - qtz to 5-6 mm (embayed)
93.8 – 100	Co vein (8mm)		Ab	Breccia - clasts of angular qtz-fd rhyolite - non-jigsaw fit texture - matrix sand grade

LOG

HOLE HA7

date: | grainsize | scale 1:200

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m	structure	ML MP	S	description
100–103		1-4cm		Breccia - clasts of qtz-fd-rhyolite - foliated and subangular
103–111			Hm Se Si	Porphyritic qtz-fd rhyolite - qtz evenly distributed - qtz 1 - 8mm - fine qtz and coarse qtz - qtz rounded and angular.
111	weakly magnetic Barite? vein (1cm) zone of carbonate veining 20-25veins		Hm	Volcaniclastic sandstone - feldspar & hornblende crystals - cleaved and altered - hbl euhedral to 8mm - fd to 4mm is euhedral and often SeAb altered
120	Carbonate vein (2cm)		Hm Se Si Cl	
130	zone of < 2cm wide Co veins magnetic			
140	magnetic		Hm Co	Grey siltstone
			Se Si	Volcaniclastic sandstone - chloritised feldspar crystals with several qtz crystals
149			Si Se	
150				Monomict rhyolitic breccia

LOG

HOLE HA7

date:

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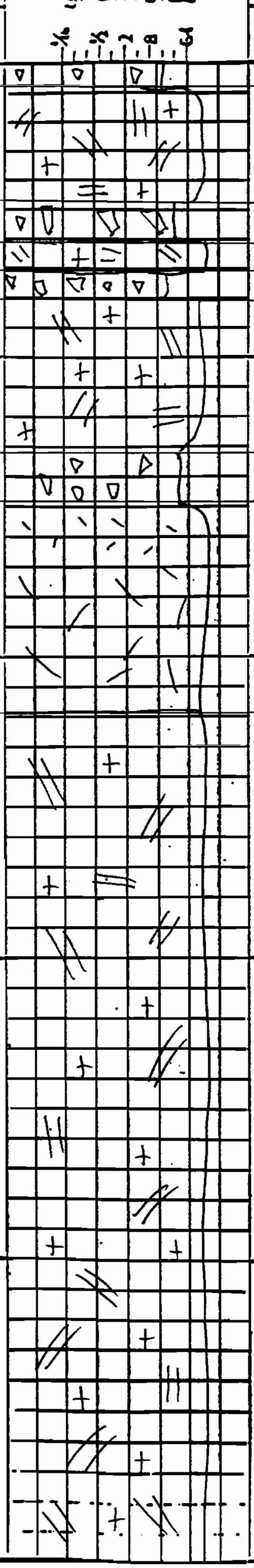


m	structure	ML MP	S	description
150 – 150·80				Monomict rhyolitic breccia
	magnetic CoSiCl vein (5cm)		Si Se	Flow banded qtz-fd rhyolite - round qtz phenocrysts to 7mm - both fine grained angular qtz and coarse embayed quartz
				Monomict rhyolitic breccia
				Flow banded qtz-fd rhyolite
	magnetic			Monomict rhyolitic breccia; angular clasts
160	HmPy vein (3cm)		Py	Flow banded qtz-fd rhyolite - qtz either embayed and coarse or fine grained and angular - groundmass is SeSi altered
	Co vein (9mm)			Monomict rhyolitic breccia - sericite altered matrix
170			Si Se Ab Cl Si Se	Finely porphyritic flow banded rhyolite Possible chilled margin - some coarse quartz phenocrysts but most quartz < 2mm
180 190 200	non magnetic Co vein (7mm) CoSi vein (2-6cm)		Si Se Py Si Se Py	Coarsely porphyritic quartz-feldspar rhyolite - rounded and fractured quartz to 7mm - euhedral feldspar to 4mm - phenocryst rich - massive rhyolite (Qtz-fd rhyolite association of the Anthony Road Andesite) - f.g. pyrite bands run parallel to cleavage. - some qtz phenocrysts contain small feldspar (now sericite) blebs suggesting quick crystallisation

LOG

date:

grainsize

scale 1:200

m	structure	ML MP	s	description
200	CoSiCl vein (1cm)			Porphyritic qtz-fd rhyolite -massive -pervasively qtz-se-py altered (groundmas. -qtz-feldspar phenocrysts preserved -qtz coarse and rounded (to 7mm) -qtz has a fractured pattern often
	non magnetic		Si Se Py	
				- feldspar not always preserved - where preserved are euhedral or elongated with cleavage
210				
				- quartz reasonably evenly distributed
220	qtz vein (5.4cm)			
			Si Se Py	
	non magnetic			
230				
233.50				

LOG Andrew Jones HA8 Summary

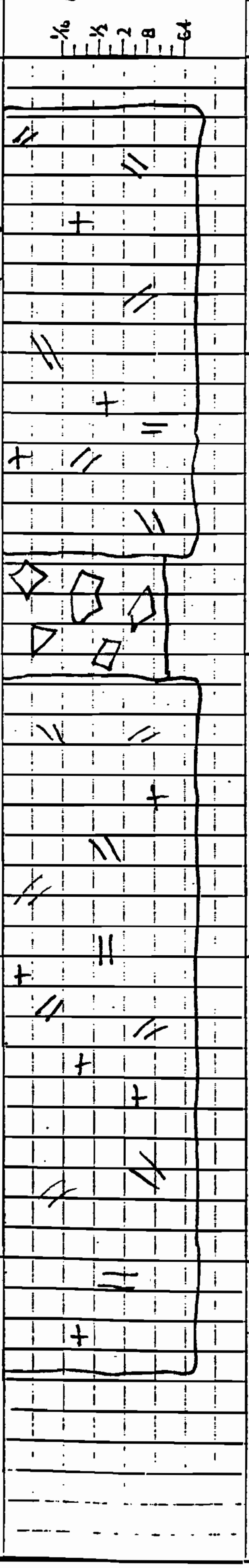
HOLE HA8

date:

scale none

page 1 of 1

m	alteration	grainsize	ML MP	S	description
3	Sericite-silica				coarse grained qtz-feld porphyry
7·8	Hematite-chl-sericite				
10	Se-Si-Pyrite				
14·7	Hematite-Se-Si Cl				
20	Se-Si-Py				
32	Se-Si-Albite				monomict breccia (lithics of qtz-feld) porphyry
37	Si-Se-Py				coarse grained quartz-feldspar porphyry (qtz phenocrysts to 6mm)
257·5					



LOG Andrew Jones — Centre for Ore Deposit and Exploration Studies

HOLE HA8

date: 8-9/6/94 | grainsize | scale 1:200

m	structure	ML MP	s	description
0	no core			Tricone
3 4.6 7.4	core trays are magnetic		Se Si	Qtz-fd crystal bearing volcaniclastic -clear rounded qtz crystals to 6mm -pink feldspars to 3mm -pale sericitised matrix -some qtz crystals are angular -small magnetite xals and chlorite altered ferromag (5-10% xals)
7.8 10			Hm Cl Se Si Se Si Se Py	Intensely altered -qtz and feldspar crystals/phenocrysts -qtz to 6mm -fd to 4mm -pyrite bands / sericite pervasive
14.7 18.3 20	flow banded		Si Se Hm	Qtz-feldspar rhyolite -alteration intense -qtz embayed → angular
21 21.45 30	flow banded		Se Py Py Si Se	Porphyritic qtz-feld rhyolite (qtz-fd rhyolite association of the Anthony Road Andesite) -qtz phenocrysts to 6mm -pseudobreccia textures (20-25m)
32		1-7 cm	Ab Py Si Se	Monomict breccia -clasts of qtz-fd rhyolite -grey flooding of matrix -Albite altered pink feldspars
37 40 50	qtz-co veins (1-2cm)		Co Si Se Py	coarse porphyritic qtz-fd rhyolite -intense silicification locally

LOG

HOLE HA8

date: | grainsize | scale 1:200

page 2 of 6

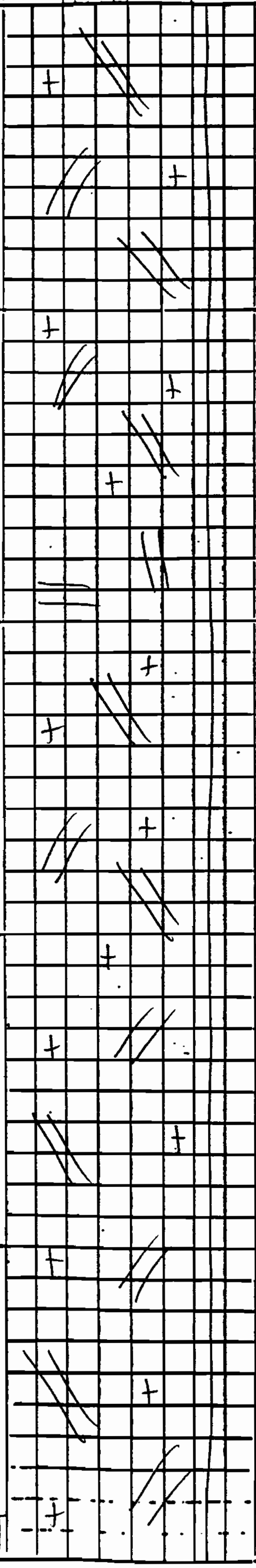
m	structure	grainsize	ML MP	S	description
50				Si Se Py	Massive coarsely porphyritic quartz-feldspar-phyric rhyolite -rounded/embayed quartz phenocrysts 4-7mm
60				Si	- alteration is intense in places - intensity even to the stage of altering quartz
70				Si Se Py	
				Si Se Py	Siliceous flooding of groundmass imparts a pseudobreccia texture on rhyolite from 50-100m.
80				Py Se Si	
90				Si Se Py	
				Si Se	
100					

LOG

HOLE HA8

date: | scale 1:200 | page 3 of 6

m	structure	grainsize	ML MP	S	description
100				Si Se Py	Silica flooding in places
					m.g. to c.g. qtz-feld rhyolite
					- qtz phenocrysts ½mm to 6mm angolar to embayed and rounded
110				Si Se Py	- feldspar is mostly altered and destroyed
					- flow banding
					- alteration patchy to intense
				Si Se Py	- quartz quite evenly distributed
					- qtz ~ 5% of rock
120					
				Si Se Py	
	quartz vein (5cm)				
130	Pyrite veins (~2cm)				
				Si Se	
140					
				Si Se	
				Si Se	
150	Fault zone				



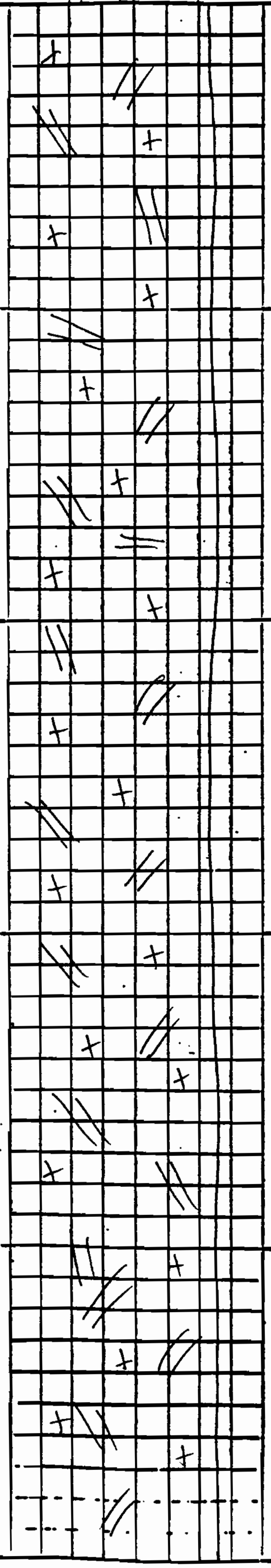
LOG

HOLE HA8

date: | grainsize | scale 1:200

page 4 of (

m	structure	grainsize	ML MP	s	description
150				Si Se Py	Lots of pyrite 150 - 179m
					-coarse quartz phenocrysts to 7mm -euhedral feldspars 2-3mm preserved
					Qtz-fd porphyritic rhyolite
160					- flow banding throughout
					- qtz evenly distributed
	carbonate vein (4cm)			Si Se Py	
170				Si Se Py	Fragmental pseudobreccia texture due to Py÷Se alteration - qtz phenocrysts part in apparent clasts & part in groundmass - qtz phenocrysts to 8mm
				Ca	
180				Si Se Ab Py Se Si	Massive qtz-feld rhyolite - qtz evenly distributed
					- qtz phenocrysts 1-6mm
190				Se Py Si	- very intense SeSiPy alteration with some quartz phenocrysts being destroyed
200					



LOG

HOLE HA8

date: | grainsize | scale 1:200 | page 5 of 6

m	structure	grainsize	ML MP	s	description
200	qtz qtz-co veins			Ab Se Si Py cl	chloritised remnant ferromagnesian phase (biotite or hornblende?) Massive coarsely porphyritic qtz-fd rhyolite - embayed/rounded and fractured qtz phenocrysts to 6mm
210				Si Se Py Si Si Se	- fragmental texture due to intense SiSe alteration
220				Si Si Se	
230				Si Se Py	- silica replaces parts of groundmass and gives fragmental texture
240					- qtz evenly porphyritic (rounded to embayed)
250					

LOG

date:

grainsize

scale 1:200

HOLE HA8

page 6 of

m	structure	grainsize	ML MP	S	description
250				Si Se	Qtz-fd rhyolite
251·50					
					EOH HA8 251·50m

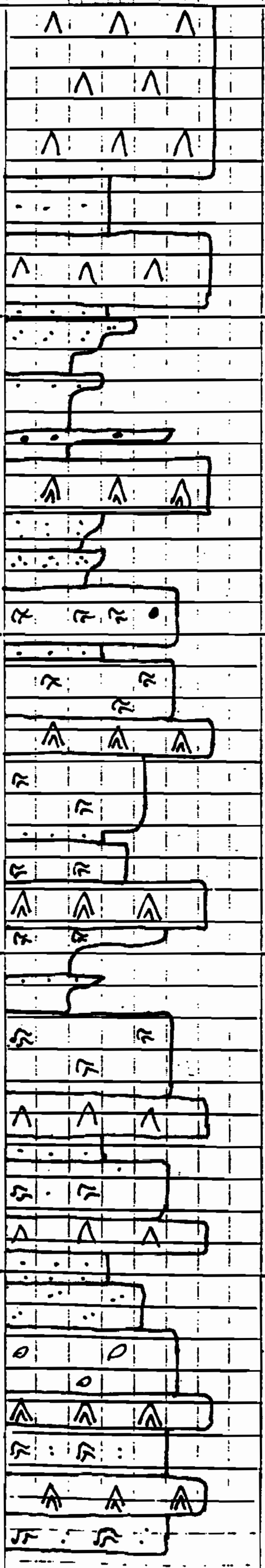
LOG Andrew Jones CODES Summary of LEECH HILL

HOLE LEECH HILL

date:

scale none

page 1 of 1

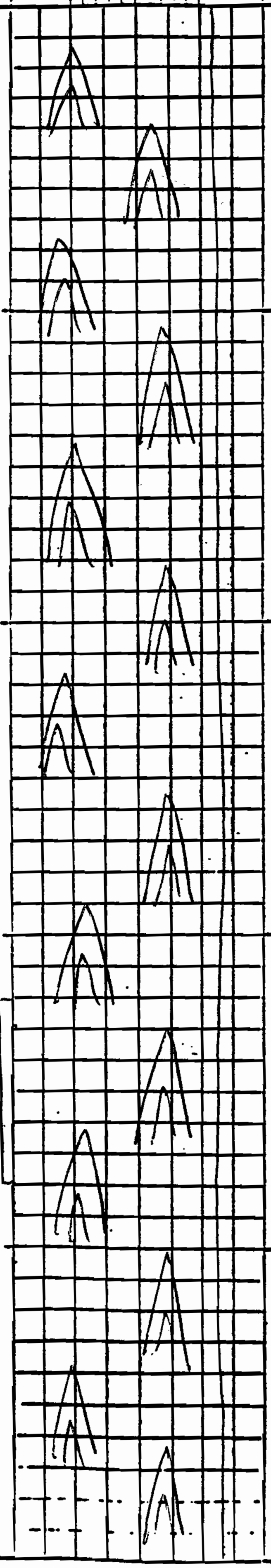


m	alteration	grainsize	ML MP	S	description
	SeSiCl±Py				vesiculated fd-hbl-px-phyric (non-magnetic) andesite coherent (hbl all altered?)
274.5					volcaniclastic green siltstone; non bedded
280.15	SeCl				Non magnetic fd-hbl phyric andesite dyke (hbl to 7mm)
303.10	SeSi				white/grey volcaniclastic siltstone/mudstone (laminated)
312.55					Fd xal siltstone/mudstone
314.65					Lithic sandstone/conglomerate – black mudstone
315.5	SiSeClPy				Fd-hbl andesite dyke (hbl to 6mm)
320.15	SeCl				Volcaniclastic siltstones (weakly bedded) (ovoid inclusions ?)
324.4	SeSi				Pumiceous sandstone/breccia (fd)
328.8					Siltstone
329.6	SeSiPy				Pumiceous sandstone/breccia (no quartz)
342.15	SeSiCl				Dyke of Fd-hbl andesite (hbl to 8mm)
344.6	SeSiPy				Fd-phyric pumiceous sandstone – siltstone
356.5					Pumiceous sandstone/breccia
359.4	SiPySeCl				Fd-hbl andesite; hbl to 6-7mm
364.6	SiSePy				Pumiceous breccia/sandstone-siltstone-silicified mudstone
368.4					Fd xal sist – mst
374					Pumiceous fd-phyric breccia/sandstone
385.7	SeSiCl				Fd-hbl andesite dyke (hbl to 5mm)
387.5	SiSePy				Siltstone
391					Fd sandstone/breccia with pumice
403	SiPySe				Dyke of fd-hbl andesite; hbl py alt to 9mm
406.9	SiSePy				Fd siltstone
431.6					Fd sandstone
441.8					Conglomerate/breccia; lithics of SiSe alt sediment
458	SeClPySi				intrusive fd-hbl andesite dyke (hbl to 8mm)
460.5	SiSePy				Pumice - feldspar xal breccia/sandstone
492.5	SeClPy				Fd-hbl andesite dyke (hbl to 6mm)
503.1	SiSePy				Fd-pumiceous sandstone/breccia
504.05					

LOG Andrew Jones | CODES | Drilled in 1985 | HOLE LEECH HILL

date: 3/4/95 | grainsize | scale 1:200

m	structure	grainsize	ML MP	s	description	page 1 of
0	CORE VERY BROKEN				Feldspar - hornblende ± pyroxene - phy. andesite	
					- oxidised to 65m	
					- fd & hbl weathered	
	non magnetic			Si Se	- unit has calcite filled vesicles and amygdules to 2cm	
				Cl	(feldspar - hornblende andesite / dacite association of the Anthony Road Andesite)	
10						
20						
30	CORE VERY BROKEN					
40						
50						

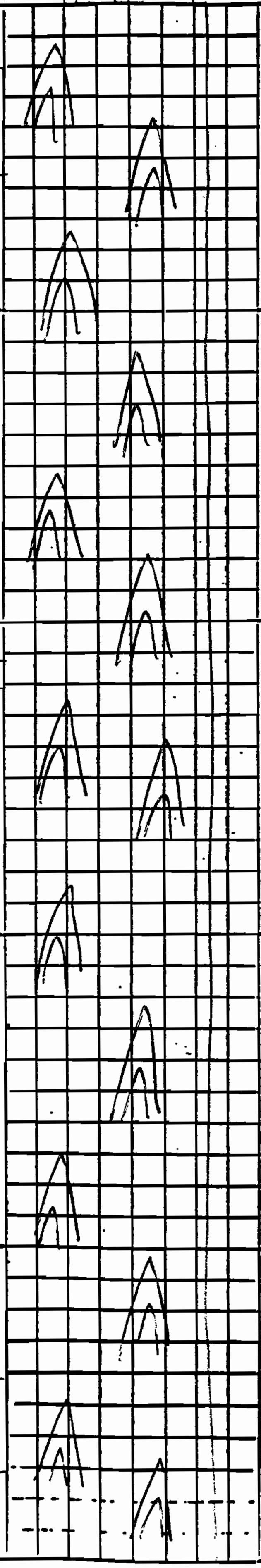


LOG

HOLE LEECH HILL

date: | grainsize | scale 1:200 | page 2 of 11

m	structure	grainsize	ML MP	s	description
50					Massive fd-hbl-phyric andesite - alteration largely obscurs hornblende - groundmass is sesicl altered - pyrite throughout
	CORE VERY BROKEN				
60	QtzCo vein (15cm)				
				Si Se Cl	
70					Calcite filled vesicles
	Fault			Si Se	
80					
90				Se Si Cl	Chlorite patches
	Py Qtz veins			Se Si Cl Py	
	CORE BROKEN				
100					



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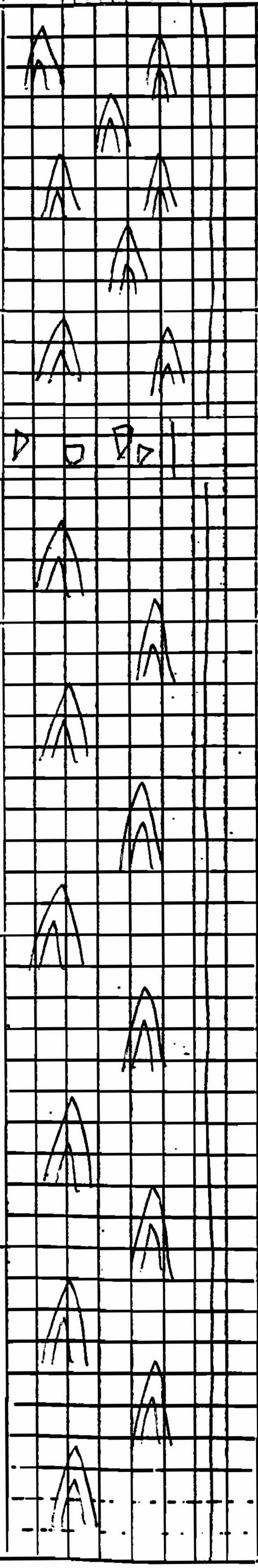
HOLE LEECH HILL

date: | grainsize | scale 1:200 | page 3 of

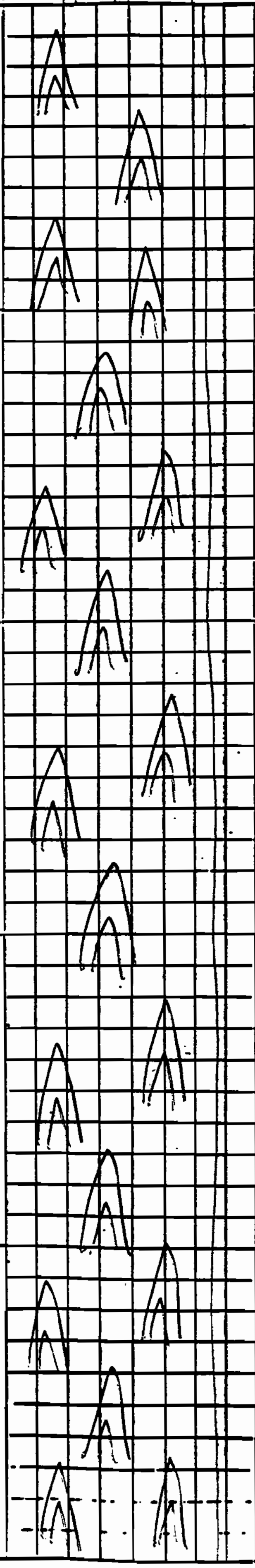


m	structure	ML MP	S	description
100			Se Si Cl Py	Massive coherent fd-hbl-phyric andesite
110				
113.5		5cm	se si cl	Monomict breccia zone within coherent unit (- vesiculated fd-hbl andesite)
115.4			Se Si Cl	Vesiculated poorly porphyritic feldspar-hornblende-phyric andesite - vesicles filled with calcite or quartz - quartz filled vesicles have a false qtz-phyric texture - phenocrysts commonly altered - fd preserved locally
120				
130	Flow banding?			
140			Se Si Cl	
150				

LOG

HOLE LEECH HILL

date: | grainsize | scale 1:200

m	structure	grainsize	ML MP	s	description
150				Se Si Cl	Massive moderate to strongly SeSiClPy altered fd-hbl andesite - hbl chlorite altered or replaced by pyrite - fd sericitised - groundmass altered to fine qtz - sericite - chlorite.
160	non magnetic				
170				Se Si Cl	
180	non magnetic				-well vesiculated (ovoid) with vesicles filled by quartz giving a false quartz porphyritic texture
190				Si Se Cl Py	- hbl chlorite altered
200					

LOG

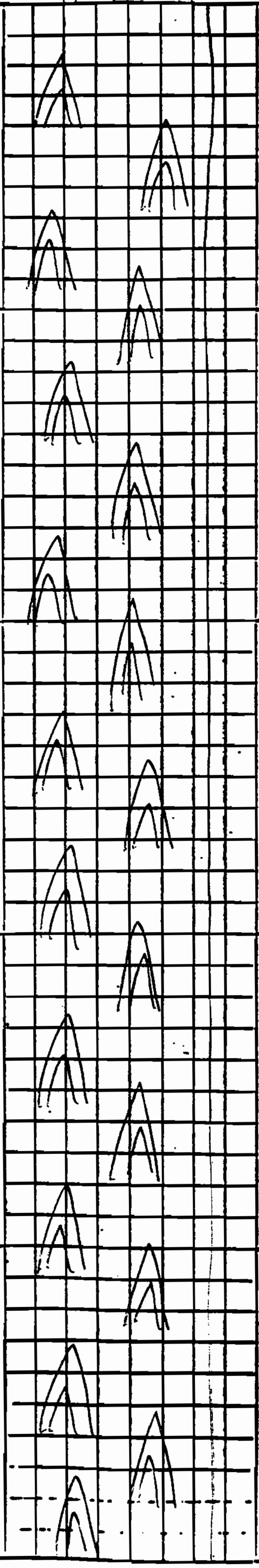
HOLE LEECH HILL

date:

grainsize

scale 1:200

m | structure | ML MP | s | description | page 5 of 1



200

intensely SeSiCl altered fd-hbl ± px phyric andesite
- qtz filled vesicules

Se Si Cl

210

non magnetic

Se Si Cl

220

230

Si Se Cl

240

- andesite appears to be chilled
- is non vesiculated
- chlorite altered patches throughout
- sericite/silica altered groundmass

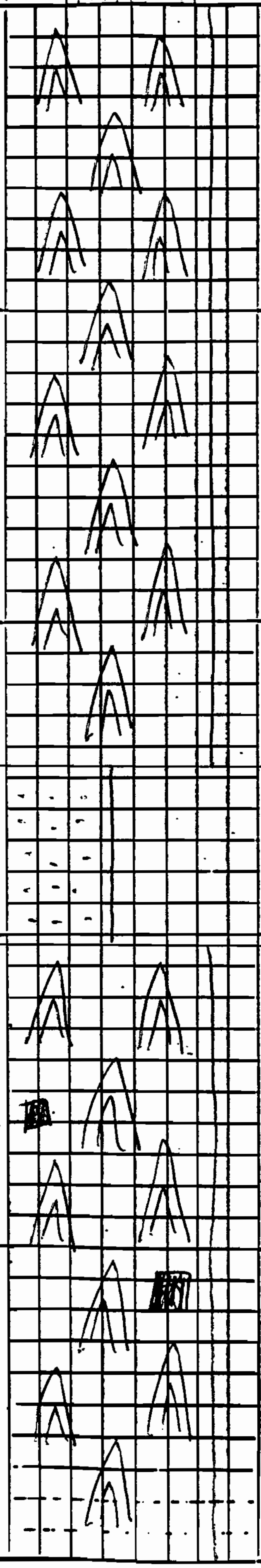
250

LOG

HOLE LEECH HILL

date: | grainsize | scale 1: 200

m	structure	grainsize	ML MP	s	description
250–274.5				Se Si Cl	Massive intensely SeSiCl altered fd-hbl? phyric andesite - pyroxene too? - still appears chilled here with finer grained groundmass intrusive cleaved contact
274.5–280	Qtz Cl vein Co vein			Co Cl	Green volcaniclastic siltstone - massive and non bedded - 2 carbonate vein sets overprint
280.15–300	non magnetic		7cm	Se Cl Se Cl	sharp contact Phenocryst-rich feldspar-hornblende porphyritic andesite - hbl phenocrysts euhedral to 7mm - a few chloritised xenoliths



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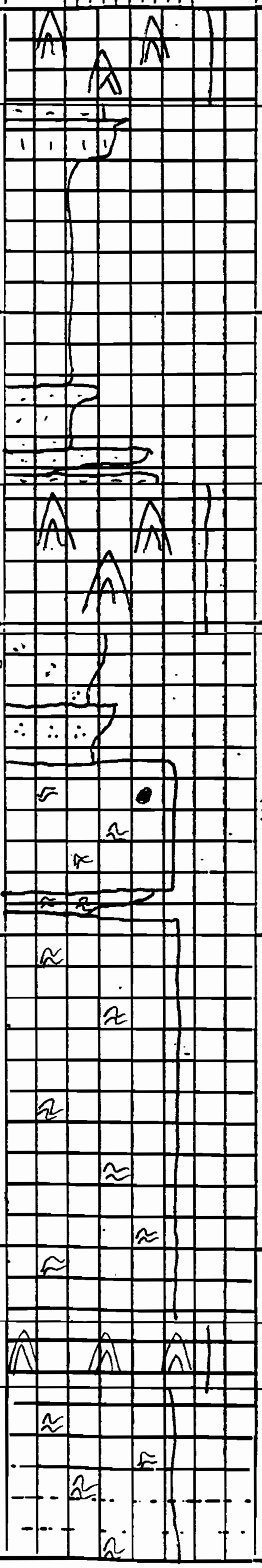
HOLE: LEECH HILL

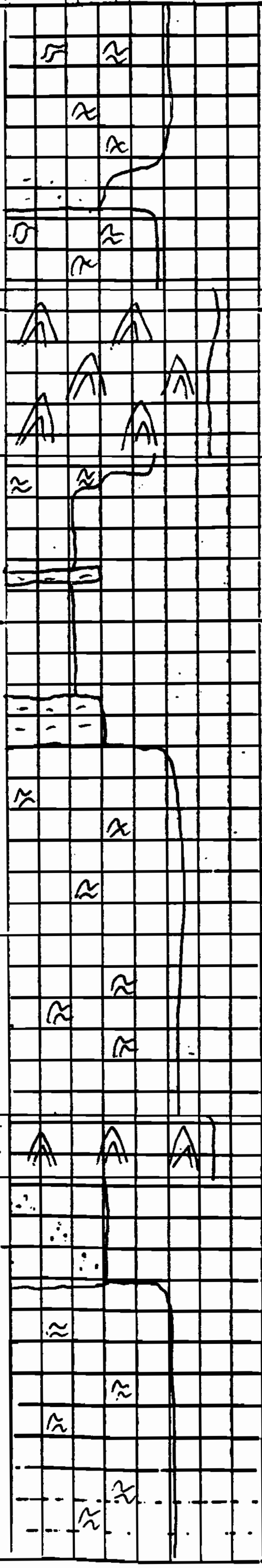
date: | grainsize | scale 1:200



m	structure	ML MP	S	description
300				Coherent fd-hbl-porphyritic andesite
303.1			Se Si Si Se	Andesitic derived siltstone / mudstone - fine grained - common laminated tops - fd / hbl crystals? - younging downhole
310	laminae at 55°			
	laminae at 30°			Black mudstone (laminated)
315.5	non magnetic		Si Se Cl Py	Coherent feld-hbl-porphyritic andesite - hbl to 6mm - fd to 3mm - hbl 5 to 10% - dyke (top & bottom intrusive contacts)
320				
320.45	Bedding at 50°		Se	Volcaniclastic sandstone / siltstone - weakly bedded
324.4		3.4 cm	Si Se	Pumiceous breccia / sandstones - fd-phyric pumice throughout
328.8				
330			Se Si Py	- flattened chloritised fiamme throughout (Yolande River Sequence)
340				
342.15	non magnetic		Se Si Cl	Dyke of fd-hbl phyric andesite - hbl to 8mm - no chilling ; intrusive contacts
344.6			Se Si Py	Pumiceous breccia / sandstone - pumice clasts have ragged margins - pumice is fd phyric
350				

LOG

date:	grainsize	scale 1:200	HOLE LEECH HILL

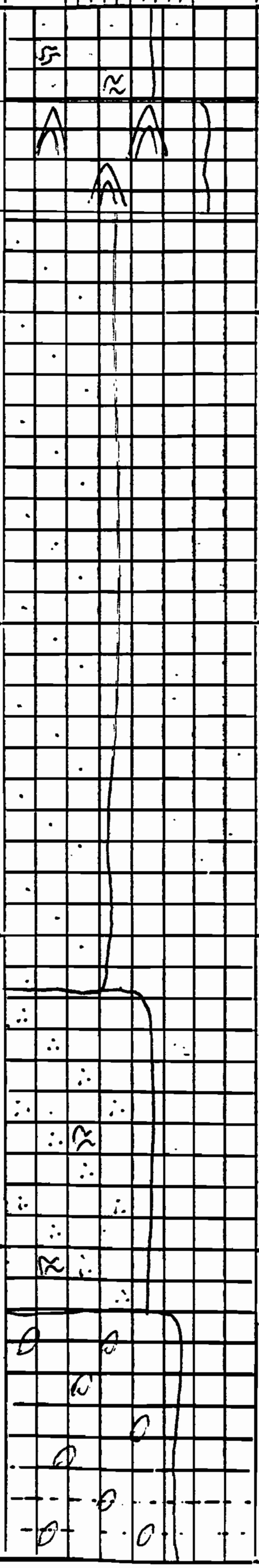


m	structure	ML MP	s	description
350				
	pyrite bands (<1cm)		Se Si	Pumiceous breccia/sandstone - pumice is feldspar-porphyritic - pyrite replaces fiamme
355.70				
356.50				
359.4				
360	non magnetic qtz vein (1cm)		Si Se Cl Py	Coherent fd-hbl-phyric andesite -hbl cl altered and replaced by pyrite -hbl to 6-7mm
364.65	bedding at 45°		Si Se	Pumiceous sandstone/volcanic mudstone -fd xals
368.4			Si Se Py	
370				
374				- pumice is SiSe altered
380				
385.7			Se Si Cl	Fd-hbl andesitic dyke -hbl to 5mm; fd altered
387.5			Si Se	Volcanic siltstone
390				
391			Si Se Py	Pumiceous breccia/sandstone - pumice is fd-phyric
400				

LOG

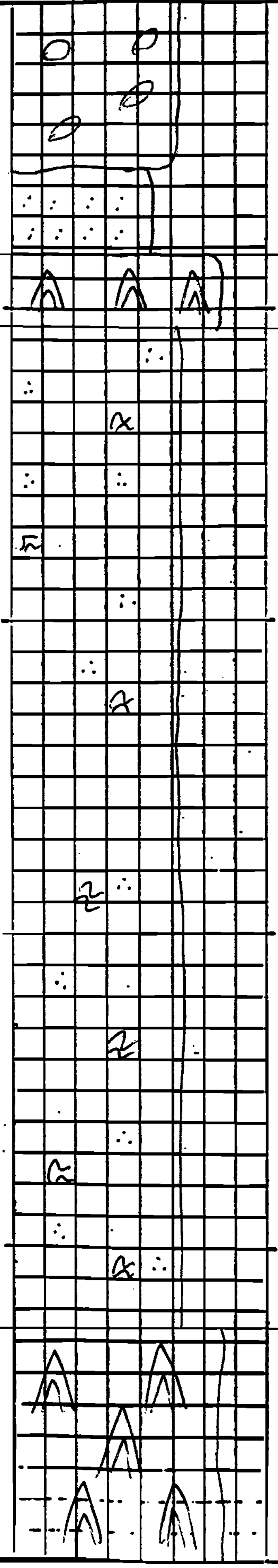
HOLE LEECH HILL

date: | scale 1:200 | page 9 of 1

m	structure	grainsize	ML MP	s	description
400					Pumiceous sandstone
403				Si Se Py	Dyke of fd-hbl andesite - hbl to 9mm - strongly altered
406·90				Se Si Py	Strongly altered siltstone - disseminated pyrite throughout - fd xals to 2mm
410					
420					
430					
431·6	cleavage 30°			Si Se Py	Coarse grained sandstone - contain fd-phyric flattened pumice and fd crystals.
440					
441·6					
441·9	Pyrite veins		2cm	Si Se Py	Conglomerate - lithics of strongly Si Se altered sandstone?
450					

LOG

date: | grainsize | scale 1:200



m	structure	ML MP	S	description
450				
455.5			Si Se Py	Fd sandstone - highly altered
458.20	not magnetic		Se Cl Py	Dyke of fd-hbl andesite -hbl to 8mm; fd 3-5mm -intrusive sharp contacts
460				
460.50	bedding 80° pyrite veins (3cm) cleavage 30°		Si Se Py Si Se Py	Altered sandstone/breccia/siltstone - dacitic - contains fd crystals throughout - altered pumice clasts
470				
480				
490				
492.45	non magnetic		Se Cl Py	Fd-hbl porphyritic andesitic dyke - hbl to 6mm - intrusive contacts -no chilled margin
500				

LOG

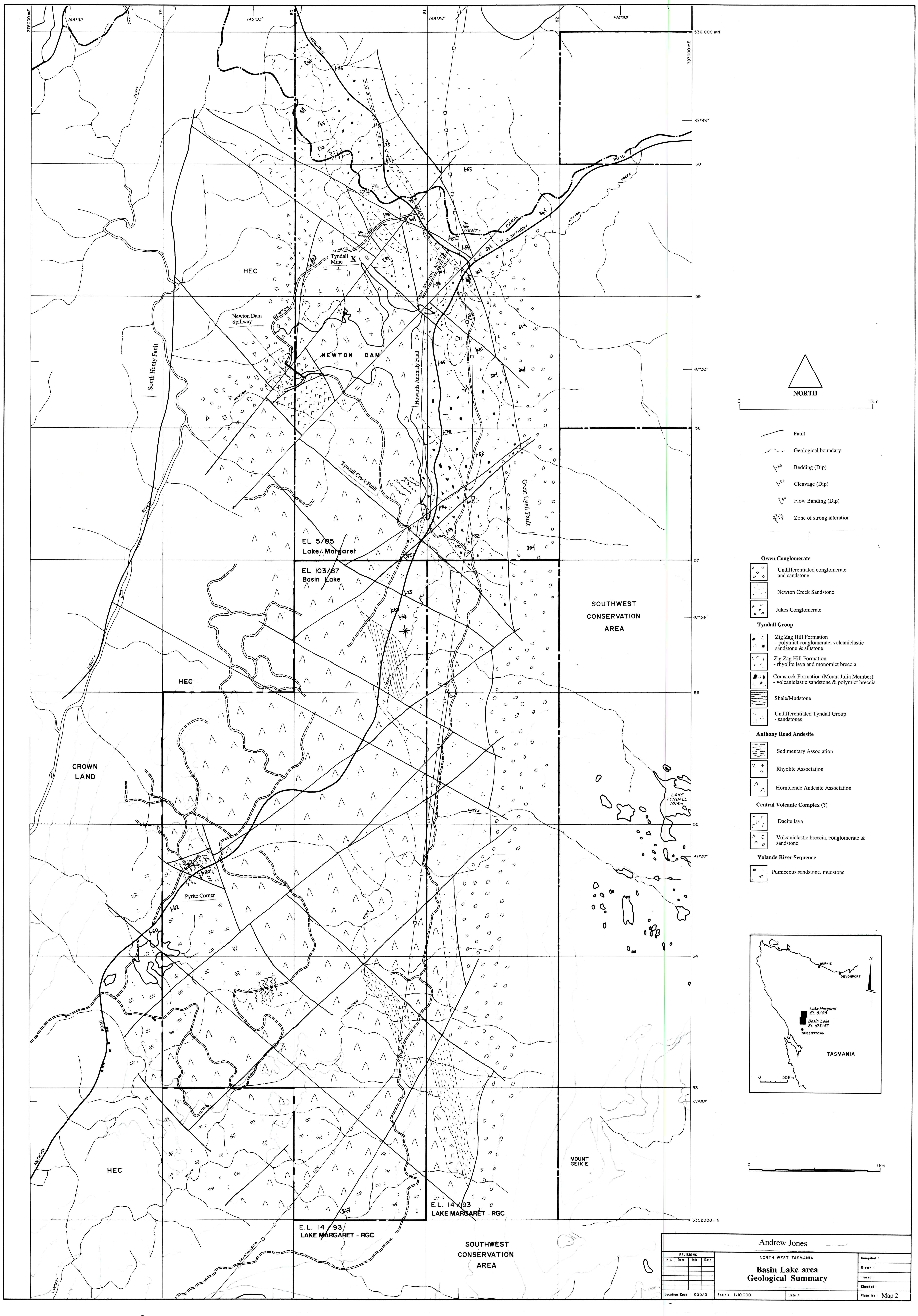
date:		grainsize	scale 1:200		HOLE LEECH HILL
m	structure		ML MP	s	description	page 11 of 11
500					Coherent andesite dyke
503·1				Si Se Py	Pumiceous breccia/sandstone (fd-phyric)
504·05					E.O.H. LEECH HILL 504·05m

APPENDIX H

MAPS OF THE STUDY AREA

Basin Lake area - Geological Summary

Map located in back pocket of thesis.



Andrew Jones
NORTH WEST TASMANIA
Basin Lake area
Geological Summary
REVISIONS
Init. Date Init. Date
Compiled :
Drawn :
Traced :
Checked :
Location Code : K55/5
Scale : 1:10 000
Date :
Plate No : Map 2
NORTH
Fault
Geological boundary
Bedding (Dip)
Cleavage (Dip)
Flow Banding (Dip)
Zone of strong alteration
Owen Conglomerate
Undifferentiated conglomerate and sandstone
Newton Creek Sandstone
Jukes Conglomerate
Tyndall Group
Zig Zag Hill Formation - polymict conglomerate, volcaniclastic sandstone & siltstone
Zig Zag Hill Formation - rhyolite lava and monomict breccia
Comstock Formation (Mount Julia Member) - volcaniclastic sandstone & polymict breccia
Shale/Mudstone
Undifferentiated Tyndall Group - sandstones
Anthony Road Andesite
Sedimentary Association
Rhyolite Association
Hornblende Andesite Association
Central Volcanic Complex (?)
Dacite lava
Volcaniclastic breccia, conglomerate & sandstone
Yolande River Sequence
Pumiceous sandstone, mudstone
TASMANIA
BURNIE
DEVONPORT
QUEENSTOWN
Lake Margaret EL 5/85
Basin Lake EL 103/87
Tyndall Mine
Newton Dam Spillway
NEWTON DAM
South Henty Fault
Howards Anomaly Fault
Tyndall Creek Fault
Great Lyell Fault
Pyrite Corner
HEC
CROWN LAND
SOUTHWEST CONSERVATION AREA
MOUNT GEIKIE
LAKE TYNDALL
EL 5/85 Lake Margaret
EL 103/87 Basin Lake
E.L. 14/93 LAKE MARGARET - RGC
5352000 mN
5361000 mN
378000 mE
383000 mE